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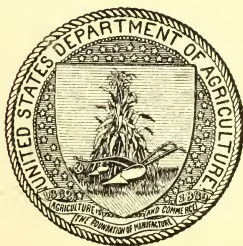
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REPORT
OF
THE FORESTER
FOR
1909
BY
GIFFORD PINCHOT.

[FROM ANNUAL REPORTS OF THE DEPARTMENT OF AGRICULTURE.]



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REPORT OF THE FORESTER.

U. S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, D. C., December 1, 1909.

SIR: I have the honor to transmit herewith a report of the work of the Forest Service for the fiscal year ended June 30, 1909, together with an outline of the plans for the work of the Service for the current fiscal year.

Respectfully,

GIFFORD PINCHOT,
Forester.

HON. JAMES WILSON,
Secretary of Agriculture.

CLASSIFICATION OF EXPENDITURES.

The following statement classifies the Forest Service expenditures of the year under the several fields of work as they will be dealt with in this report:

Forest Service expenditures, fiscal year 1909.

Administration and protection of National Forests.....	\$2,955,425.01
Permanent improvements, National Forests.....	599,471.02
Federal cooperation	31,572.27
General investigations (including state and private cooperation).....	267,039.15
Diffusion of information ^a	82,790.02
Total expenditures for Forest work.....	<u>3,936,297.47</u>

This amount was derived from the following sources:

Agricultural appropriation act, for salaries and general expenses.....	\$3,296,200.00
Agricultural appropriation act, for improvement of the National Forests.....	600,000.00
Total Forest Service appropriations.....	\$3,896,200.00
Agricultural appropriation act, for naval stores industry (\$10,000, less \$1,050.68 carried over to fiscal year 1910).....	8,949.32
Agricultural appropriation act, for paper tests (allotted to the Forest Service).....	3,100.00
Total available from agricultural appropriation act funds...	<u>3,908,249.32</u>

^a Includes cost of stencils for addressing machines, \$17,975. (See p. 40.)

Federal cooperation (expenditures reimbursed by other bureaus)-----	\$15, 239. 41	
Contributed by other cooperators-----	26, 687. 63	
		\$41, 927. 04
Total available for Forest work-----		3, 950, 176. 36
Less unexpended balances to be returned to the Treasury:		
From appropriation salaries and general expenses-----	\$13, 335. 78	
From appropriation improvement of the National Forests-----	528. 98	
From appropriation paper tests-----	14. 13	
		13, 878. 89
Total expenditures for Forest work-----		3, 936, 297. 47

Under the law, unexpended balances are available for two years to meet any outstanding liabilities, but will, for the most part, revert to the general fund of the Treasury.

The total disbursements from appropriations were 14 per cent greater than those of the previous year, and the disbursements on account of the National Forests, shown in the first two items, were a trifle less than 14 per cent greater, but the National Forest area was increased during the year by nearly 18 per cent.

The total expenditures for all purposes are shown below:

Total expenditures for Forest work, as above-----	\$3, 936, 297. 47	
Refunds to depositors of excess deposits-----	\$40, 098. 73	
Fencing Montana national bison range-----	219. 60	
Payments to State of 25 per cent of receipts from National Forests for fiscal year 1908-----	444, 379. 00	
Payments from timber receipts, on behalf of Uintah Indians (33 Stat., 1070)-----	5, 348. 07	
Payments from cooperative funds on account of 1908 liabilities-----	2, 356. 04	
		492, 401. 44
Total disbursements-----		4, 428, 698. 91

The amounts paid to States and Territories, to be expended for roads and schools, were as follows:

Arizona-----	\$42, 631. 27	New Mexico-----	\$25, 464. 75
Arkansas-----	313. 68	Oklahoma-----	554. 48
California-----	52, 183. 02	Oregon-----	32, 318. 82
Colorado-----	59, 761. 28	South Dakota-----	8, 253. 47
Idaho-----	71, 423. 46	Utah-----	32, 681. 49
Kansas-----	643. 55	Washington-----	13, 855. 31
Montana-----	61, 941. 46	Wyoming-----	35, 170. 48
Nebraska-----	2, 349. 77		
Nevada-----	4, 832. 71	Total-----	444, 379. 00

THE NATIONAL FORESTS.

AREA.

The net result of the additions, eliminations, and new Forests created during the year by Presidential proclamations was to increase the total National Forest gross area by 26,528,439 acres.

An extensive rearrangement of National Forest boundaries during the year, for better administration, with a renaming of many For-

ests, makes it possible to show the gross area changes only by States, as follows:

National Forest gross areas, by States.

State or Territory.	Area June 30, 1908.	Additions and crea- tions.	Elimina- tions.	Area June 30, 1909.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona.....	13,385,990	2,121,543	248,672	15,258,861
Arkansas.....	1,991,899	1,197,882	.....	3,189,781
California.....	25,605,709	2,364,483	1,682	27,968,510
Colorado.....	15,746,932	^a 5,282	53,775	15,698,439
Florida.....	.....	674,891	.....	674,891
Idaho.....	20,336,427	.....	^b 237,398	20,099,029
Kansas.....	302,387	.....	.....	302,387
Michigan.....	.....	163,373	.....	163,373
Minnesota.....	294,752	909,734	.....	1,204,486
Montana.....	20,402,676	.....	12,980	20,389,696
Nebraska.....	556,072	.....	.....	556,072
Nevada.....	2,591,052	2,518,363	.....	5,109,415
New Mexico.....	^c 8,474,547	2,511,875	14,711	10,971,711
North Dakota.....	.....	13,949	.....	13,940
Oklahoma.....	60,800	.....	.....	60,800
Oregon.....	16,331,892	.....	110,524	16,221,368
South Dakota.....	1,233,720	30,720	.....	1,294,440
Utah.....	7,414,232	22,095	.....	7,436,327
Washington.....	12,065,500	.....	.....	12,065,500
Wyoming.....	8,998,723	.....	.....	8,998,723
Total in United States.....	^d 155,823,310	12,534,181	679,742	167,677,749
Alaska.....	12,087,626	14,674,000	.....	26,761,626
Porto Rico.....	65,950	.....	.....	65,950
Grand total.....	^d 167,976,883	27,208,181	679,742	194,505,325

^a Increase in Colorado of 5,282 acres due to corrected figures from subsequent surveys in Battlement National Forest.

^b Decrease in Idaho of 237,398 acres due to corrected figures by General Land Office in Pend Oreille National Forest.

^c Increase in New Mexico total of 1,280 acres over that given in last year's report due to correction made after report was printed.

^d Increase in totals over those given last year due to correction of New Mexico area as noted.

The names of the individual Forests, and their gross and net areas, on June 30, 1909, are shown below. Net areas, as here given, are obtained by deducting not only lands actually alienated through the issuance of patent or final certificate, but also claims entered or pending, in so far as these are known to the Forest Service through notification from the General Land Office.

Names of individual Forests and their gross and net areas June 30, 1909.

Forest.	Gross area.	Net area.	Forest.	Gross area.	Net area.
Arizona:	<i>Acres.</i>	<i>Acres.</i>	California—Continued.	<i>Acres.</i>	<i>Acres.</i>
Apache.....	1,785,711	1,745,981	Inyo.....	1,458,444	1,308,444
Chiricahua ^a	287,520	278,808	Klamath.....	2,094,467	1,769,825
Cocconino.....	3,689,982	3,148,577	Lassen.....	1,373,043	1,047,559
Coronado.....	966,368	942,598	Modoc.....	1,471,817	1,283,797
Crook.....	788,624	736,606	Mono.....	813,789	779,514
Dixie.....	626,800	621,600	Monterey.....	514,477	452,553
Garces.....	644,395	609,629	Plumas.....	1,407,053	1,095,711
Kaibab.....	1,080,000	1,079,720	San Luis.....	355,990	329,320
Prescott.....	1,541,762	1,440,362	Santa Barbara.....	2,027,180	1,794,055
Sitgreaves.....	1,470,364	1,331,884	Sequoia.....	3,079,942	2,628,742
Tonto.....	2,110,354	2,011,527	Shasta.....	1,754,718	670,552
Zuni.....	266,981	138,661	Sierra.....	1,935,680	1,790,030
Arkansas:			Siskiyou.....	37,814	33,546
Arkansas.....	1,663,300	1,127,060	Stanislaus.....	1,117,625	691,865
Ozark.....	1,526,481	577,201	Tahoe.....	1,931,042	1,014,664
California:			Trinity.....	1,834,833	1,441,411
Angeles.....	1,350,900	1,167,740	Colorado:		
California.....	1,114,904	835,314	Arapaho.....	796,815	752,828
Cleveland.....	2,236,178	1,408,793	Battlement.....	759,002	754,538
Crater ^a	58,614	45,417	Cochetopa.....	932,890	907,299

^a Forests situated in two States. Alienated areas apportioned.

Names of individual Forests and their gross and net areas June 30, 1909—Continued.

Forest.	Gross area.	Net area.	Forest.	Gross area.	Net area.
Colorado—Continued.	<i>Acres.</i>	<i>Acres.</i>	New Mexico:	<i>Acres.</i>	<i>Acres.</i>
Gunnison.....	945,350	902,244	Alamo.....	1,513,817	1,229,917
Hayden ^a	84,000	80,127	Carson.....	1,390,680	1,349,817
Holy Cross.....	595,840	567,202	Chiricahua ^a	178,977	173,169
La Sal ^a	29,502	29,342	Datil.....	2,869,888	2,501,868
Las Animas ^a	196,140	101,330	Gila.....	1,782,562	1,646,242
Leadville.....	1,184,730	1,006,765	Jemez.....	944,085	916,905
Medicine Bow.....	659,780	639,342	Las Animas ^a	480	.....
Montezuma.....	1,175,811	1,061,802	Lincoln.....	677,790	566,910
Pike.....	1,457,524	1,292,187	Manzano.....	587,110	435,930
Rio Grande.....	1,262,158	1,152,242	Pecos.....	622,322	566,912
Routt.....	1,049,686	951,523	Zuni ^a	404,000	210,590
San Isabel.....	560,848	515,872	Oklahoma:		
San Juan.....	1,460,880	1,277,986	Wichita.....	60,800	54,360
Sopris.....	655,360	618,941	Oregon:		
Uncompahgre.....	921,243	834,808	Cascade.....	1,767,370	1,634,753
White River.....	970,880	955,233	Crater.....	1,061,220	828,097
Florida:			Deschutes.....	1,504,207	1,275,637
Choctawhatchee.....	467,606	147,086	Fremont.....	1,260,320	1,167,029
Ocala.....	207,285	151,195	Malheur.....	1,167,400	1,003,078
Idaho:			Oregon.....	1,787,280	1,542,651
Beaverhead ^a	304,140	305,283	Siskiyou ^a	1,264,579	1,115,187
Boise.....	1,147,360	1,104,560	Siuslaw.....	821,794	400,294
Cache ^a	276,640	270,880	Umatilla.....	540,496	388,256
Caribou ^a	733,000	716,160	Umpqua.....	1,567,500	1,153,400
Challis.....	1,161,040	1,160,880	Wallowa.....	1,750,240	1,582,183
Clearwater.....	2,687,860	2,502,000	Wenaha ^a	494,942	455,168
Coeur d'Alene.....	1,543,844	1,252,784	Whitman.....	1,234,020	1,114,154
Idaho.....	1,293,280	1,259,560	South Dakota:		
Kaniksus ^a	544,220	461,047	Black Hills.....	1,190,040	1,039,910
Lemhi.....	955,408	954,728	Sioux ^a	104,400	97,770
Minidoka ^a	619,204	596,644	Utah:		
Nezperce.....	1,946,340	1,930,558	Ashley ^a	947,490	898,330
Payette.....	844,240	771,760	Cache ^a	257,200	212,440
Pend Oreille.....	913,364	830,036	Dixie ^a	475,865	456,745
Pocatello ^a	288,148	274,268	Fillmore.....	578,459	515,113
Salmon.....	1,762,472	1,752,752	Fishlake.....	537,233	434,641
Sawtooth.....	1,211,920	1,204,800	La Sal ^a	444,628	429,086
Targhee ^a	1,101,720	1,059,360	Manti.....	786,080	677,855
Weiser.....	764,829	663,509	Minidoka ^a	117,203	79,723
Kansas:			Nebo.....	343,920	329,861
Kansas.....	302,387	190,967	Pocatello ^a	10,720	9,479
Michigan:			Powell.....	726,159	721,479
Marquette.....	30,603	21,109	Sevier.....	710,920	664,520
Michigan.....	132,770	66,296	Uinta.....	1,250,610	1,215,273
Minnesota:			Wasatch.....	249,840	230,666
Minnesota.....	294,752	294,752	Washington:		
Superior.....	909,734	582,149	Chelan.....	2,492,500	2,428,540
Montana:			Columbia.....	941,440	748,520
Absaroka.....	980,440	852,030	Colville.....	869,520	764,920
Beartooth.....	685,293	681,631	Kaniksus ^a	406,520	323,346
Beaverhead.....	1,506,680	1,502,397	Olympic.....	1,594,560	1,416,016
Bitterroot.....	1,180,900	1,077,550	Rainier.....	1,641,280	934,000
Blackfeet.....	1,956,340	1,788,820	Snoqualmie.....	961,120	684,142
Cabinet.....	1,020,960	901,756	Washington.....	1,419,040	1,371,890
Custer.....	590,720	524,870	Wenaha ^a	318,400	294,538
Deerlodge.....	1,080,220	1,045,780	Wenatchee.....	1,421,120	787,170
Flathead.....	2,092,785	1,911,457	Wyoming:		
Gallatin.....	907,160	600,480	Ashley ^a	4,596	4,596
Helena.....	930,180	784,130	Bighorn.....	1,151,680	1,144,344
Jefferson.....	1,255,320	1,136,909	Bonneville.....	1,627,840	1,602,938
Kootenai.....	1,061,260	1,409,314	Caribou ^a	7,740	6,860
Lewis and Clark.....	844,136	842,417	Cheyenne.....	617,932	537,168
Lolo.....	1,211,680	890,512	Hayden ^a	370,911	333,211
Madison.....	1,102,860	1,089,272	Shoshone.....	1,689,680	1,664,474
Missoula.....	1,237,509	861,940	Sundance.....	183,224	142,002
Sioux ^a	145,253	135,963	Targhee ^a	377,600	373,160
Nebraska:			Teton.....	1,991,200	1,944,600
Nebraska.....	556,072	522,532	Wyoming.....	976,320	961,520
Nevada:			Alaska:		
Humboldt.....	1,158,814	1,046,762	Chugach.....	11,280,640	11,188,975
Inyo ^a	62,573	52,573	Tongass.....	15,480,986	15,467,061
Moapa.....	390,580	381,980	Porto Rico:		
Mono ^a	535,337	513,912	Luquillo.....	65,950	32,975
Nevada.....	1,222,312	1,202,832	Total.....	194,505,325	172,230,233
Tahoe ^a	61,085	33,316			
Toiyabe.....	1,678,714	1,674,714			

^a Forests situated in two States. Alienated areas apportioned.

In the month of May a field investigation was begun of the present National Forest boundaries, to learn how they may be changed so as to exclude any land not properly included within them or to take in any naturally adapted to National Forest purposes. The results of this examination, which will be substantially, if not wholly, completed by the close of the field season, are being mapped to show the character of the land for a considerable distance on each side of all exterior boundaries, and will furnish the means for a more careful correction of the present areas, through both eliminations and additions, than has hitherto been possible.

CLAIMS AND SETTLEMENT.

The National Forests are still subject to reduction through future acquisition of land by private owners. This takes place (1) by the perfecting of claims initiated before the Forests were set aside, under public-land laws not operative after the Forest proclamation, except for claims already located, (2) by the location and perfection of new claims under those public-land laws which apply equally to National Forest lands and the unreserved parts of the public domain, and (3) by the taking up of National Forest lands listed for settlement under the Forest homestead law of June 11, 1906.

The determination of all questions of title rests wholly with the Department of the Interior, though a Forest homestead entry can be made only on land listed by that Department at the request of the Secretary of Agriculture. A proper safeguarding of the interests of the people at large, for whose benefit the National Forests are set aside, calls for such a scrutiny of claims for which patent is sought under the general public-land laws as will prevent the unlawful segregation of land from national ownership by private persons. While it would be altogether wrong if the Government, which has given the right to its citizens to patent National Forest lands under certain conditions, were to force a needless contest upon those who seek to exercise this right and are plainly entitled to what they seek, it is equally true that every perfected claim alienates land now owned by and held for the people of the United States, and that the interests of the latter should be defended against fraudulent claimants. Therefore, and at the request of the General Land Office, the Forest Service makes a field examination of claims within National Forests upon notification from the Land Office that patent has been applied for, and reports any facts thus brought to light. The Land Office then decides whether the facts reported call for a hearing to determine the right of the applicant to obtain patent.

New claims are initiated on National Forests chiefly under the mining laws. Especial care was taken, and will be continued, not to interfere with legitimate mining interests. To this end the cooperation of the various mining interests of the country has been extensively asked for and received. Mining claims were, so far as practicable, examined by geologists detailed by the Geological Survey and by expert miners employed by the Forest Service, and in all cases in which hearings are ordered because of facts reported by the Forest Service a geologist or mining expert now presents the facts. It is important, both on behalf of the Forests and in justice to claimants, that only persons technically trained in mining matters should report on mining claims, and so long as the funds necessary for the employ-

ment of such men are available this work will be exclusively in their hands.

While examinations of mining claims on National Forests by competent men are recognized by legitimate mining interests as an entirely proper and necessary course if the Forests so important to the mining industry itself are to be maintained, speculative mining claims located in order to float valueless stock—the great incubus of the mining industry—are seriously interfered with by an examination which prevents their passing to title until they can show compliance with the law in the requirement for a valid discovery.

Field examinations of 5,610 unpatented claims led to reports to the General Land Office concerning 5,115, as follows:

Reports to the General Land Office on unpatented claims.

Character of report.	Home- stead entry.	Desert- land entry.	Timber and stone entry.	Mineral entry.	Total.
Favorable.....	1,405	37	316	1,245	3,003
Unfavorable.....	957	29	451	675	2,112
Total.....	2,362	66	767	1,920	5,115

Claims to National Forest land disposed of by the Department of the Interior.

Character of action.	Home- stead entry.	Desert- land entry.	Timber and stone entry.	Mineral entry.	Total.
Patent issued.....	633	11	514	425	1,583
Canceled through relinquishment.....	334	4	3	10	351
Canceled after hearing.....	529	10	57	56	652
Total.....	1,496	25	574	491	2,586

National Forest lands are listed for homestead entry under the law of June 11, 1906, when an examination has shown that they are chiefly valuable for agriculture and not needed for public purposes. Examinations are made on the request of applicants. The applications and listings for 1909 compared with those for 1908 are shown below. A considerable excess of applications over examinations results from erroneous locations or other defects in the applications themselves, necessitating a new application, to the withdrawal of applications, or to applications for land which has already been examined. The total area listed since the passage of the law was at the close of the year 443,661 acres.

Applications and listings for homestead entry.

Fiscal year.	Number of applica- tions at close of year.	Await- ing final action at close of year.	Num- ber of tracts listed at close of year.	Acreage listed at close of year.
1909.....	3,811	3,095	1,382	148,654
1908.....	5,271	^a 2,800	1,077	238,945

^a Number corrected since last year's report.

For the sake of the Forests themselves as well as in furtherance of the principle of the best use of all kinds of land, the settlement of such areas within National Forests as can with advantage to the public be given over to agriculture is encouraged. Settlers on or near a Forest help, under a proper administrative policy, both its protection and development. Decision as to whether or not it is to public advantage that particular tracts should be opened to settlement presents, however, a complex problem. In deciding whether the land is chiefly valuable for agriculture the future needs of the community for timber and the expectation value of immature timber on the land must be considered, as well as the value of the agricultural crops which the land will produce if cleared. The National Forests are primarily a provision for the future. In many parts of the East the desire for new land in earlier days led to much clearing of tracts which have since reverted to forest, and usually inferior forest, because the land was not in reality adapted to permanent agriculture. The mistake must not be repeated in the West, where the consequences would be far more serious, because in dry climates the forest is much more easily destroyed. Even in the case of land which will permanently grow good crops, but which is covered with timber certain to be in great demand later, or with young timber just nearing market size, clearing at the present time may mean a loss like that caused by drawing money from a savings bank a few days before interest falls due.

It must also be recognized that heavily timbered land may be sought for other reasons than its agricultural value. In Idaho and eastern Washington the Forest Service recently investigated the use to which 116 perfected homestead claims in one locality had been put. These homesteads were of substantially equal natural adaptation to agriculture save for the fact that part were heavily timbered, part nontimbered land. Of the homesteads on nontimbered land every one was occupied and over 30 per cent of their total area was under cultivation, while of those on timbered land one-half of 1 per cent was under cultivation and a large majority of the claims had been sold to lumber companies.

In many cases final decision as to whether particular areas will find their best permanent use as agricultural or as forest land must be left to the future, because it is impossible to predict now what the relative demand for the products of the field and of the forest will be under conditions wholly changed from the present. In regions where improved land can be had for far less than the cost of clearing National Forest land that is no better, or where an abundance of cheap cut-over land is on the market, it is not believed that the extensive homesteading of heavily timbered National Forest land would now be a wise economic policy or a benefit to the West. On the other hand, wherever it may appear that land, even though timbered, might be farmed with advantage to the community, it should be recommended for listing as subject to homestead entry, usually after the timber has been harvested.

During the year 890 administrative sites were selected and withdrawn from entry and settlement. They are chiefly tracts needed for rangers' headquarters. A small proportion of the withdrawals were for forest nurseries.

ENFORCEMENT OF LAW.

It has been possible since the establishment of district headquarters to give much more effective assistance to the Department of the Interior in its hearings upon claims within National Forests. This co-operation has extended to practically all claims within National Forests which were apparently invalid or fraudulent. Out of 402 cases disposed of by decisions of the registers and receivers of the various local land offices or without hearing, the contentions of the United States were sustained in 291. There are now pending 738 cases. Cases involving 2,000 acres of valuable timber land in the Siskiyou National Forest, Oregon, were among the most important heard.

During the year 54 prosecutions for violations of state game laws were initiated by Forest officers. Local Forest officers are expected to assist state authorities in the enforcement of the state game laws, when this can be done without prejudice to the regular work of the Service. In localities where state officers show little interest in game law enforcement, or even opposition to Forest officers who try to enforce the laws, it is out of the question for Forest officers to take the brunt of a burden which belongs primarily to the State. Many reports of violations of game laws made by Forest officers were ignored, or where offenders were taken before justices of the peace the most convincing evidence failed to secure conviction. Where a popular prejudice against the enforcement of the State's game laws is acquiesced in by the State's local officers, the Forest Service will not undertake to enforce these game laws, for it could not enforce them if it tried, and the effort merely hampers the work of the Government in administering the Forests.

There were in litigation in federal and state courts 64 cases of timber trespass, 32 of grazing trespass, 19 of special-use trespass, 23 of fire trespass, and 19 miscellaneous cases, which included injunctions and criminal actions for larceny, bribery, and embezzlement. Of these suits, 75 were settled out of court, 9 civil and 12 criminal were won, 1 civil and 6 criminal were lost, and 54 are pending. Of the 6 criminal suits lost, 2 were for fire trespass, 1 was for embezzlement, and 3 were for grazing trespass. The last were criminal actions for violation of the regulations of the Secretary of Agriculture, and were passed upon by the United States district court for the southern district of California in a single decision, which held that violation of departmental regulations is not punishable as a crime. This decision was appealed by the United States to the Supreme Court in order that a definite ruling might be had upon the constitutional question involved. This question has been passed on by the lower courts a number of times, in a majority of cases in favor of the validity of the law which makes violation of the regulations a crime against the United States.

As against the 32 cases of grazing trespass in litigation, 306 cases were amicably settled. Of the 32 litigated cases, 7 were decided favorably to the Government, 15 cases were settled out of court favorably to the Government's contention, and 7 cases are still pending. The 3 remaining cases were those already referred to as having been appealed.

In the case of *Lewis v. Garlock* (168 Fed., 153) the circuit court for South Dakota decided that dead, mature, and insect-infested timber upon an unpatented mining claim within a National Forest may be sold by the Secretary of Agriculture, and that the rights of the claimants to the timber on such claims are subject to the Government's paramount ownership of the land on which the claims are situated.

COST AND USE.

The following tables show the cost of administration and protection, expenditures for permanent improvements, and receipts from the several sources, both in totals and per acre, during the past year, as compared with those for the fiscal year 1908:

Expenditures for administration and protection and permanent improvements during fiscal year 1909, compared with 1908.

Fiscal year.	Administration and protection.		Permanent improvements.	
	Total.	Per acre.	Total.	Per acre.
1909.....	\$2,948,153.08	\$0.01510	\$599,471.02	\$0.00309
1908.....	2,526,098.02	.01503	592,169.19	.00353

The per acre expenditures are here computed on the basis of the gross area of all National Forests under administration at the close of the year. If the net area were used instead of the gross the expenditures for all purposes would still be less than 2 cents per acre. Since interior holdings usually do not lower the cost of administration and protection, the gross area figures more nearly represent the facts. All costs incident to National Forest administration are charged in, including a fair proportion of the expense of the Washington offices of the Forest Service.

Comparison of receipts from the several sources for the fiscal years 1909 and 1908.

Fiscal year.	Grazing.		Timber.		Special uses.		All sources.	
	Total.	Per acre.	Total.	Per acre.	Total.	Per acre.	Total.	Per acre.
1909....	\$1,032,185.70	\$0.00532	\$736,192.08	\$0.00379	\$38,982.88	\$0.00020	\$1,807,270.66	\$0.00931
1908....	962,829.40	.00573	849,027.21	.00505	30,425.23	.00018	1,842,281.87	.01096

The receipts given above are without deductions for refunds of excess deposits. Such deposits are not, strictly speaking, National Forest receipts, though, under the law, they are covered into the Treasury as such. For example, timber is paid for by purchasers in advance of, and sometimes in excess of, the actual cutting. Refunds may or may not be made in the same fiscal year in which the payments were made, so that deduction of the refunds made during the year gives only approximately the true receipts. The refunds of timber receipts in 1909 amounted to \$30,738.24, and of all receipts in 1909 to \$40,098.73, as reported on page 4. Deduction of refunds would leave the total of receipts for 1909 \$1,767,171.93 and for 1908 \$1,793,602.86.

The grazing receipts for 1909 were paid by the holders of 22,163 permits to graze 1,585,905 cattle, horses, and hogs, and of 5,074 permits to graze 7,819,594 sheep and goats. The receipts from timber sales were paid by approximately 5,000 purchasers, who cut the equivalent of 352,434,000 board feet of timber. The receipts from special uses were paid by the holders of 1,112 permits, including 52 for the use of land in connection with water-power development. In other words, these receipts represent profitable use of the forests by some 33,000 individuals or concerns.

In issuing permits for reservoirs, conduits, power houses, and transmission lines for commercial power development, the Forest Service has steadfastly insisted on conditions designed to prevent speculative or perpetual holdings and to secure the full development of available power and the payment of reasonable charges for the use of land.

To the use for which payment was made must be added the heavy free use of the Forests by the public. For free use of timber see page 19.

As last year, the exact amount of free grazing on the Forests can not be stated, since no permit and therefore no record is involved. Not over 10 head of milch cows, work animals, or horses in use may be grazed free by settlers living within or near the Forests and by prospectors, travelers, and campers. In Arizona and New Mexico 30 milch goats may be grazed free. Stockmen and purchasers of timber on the Forests are also allowed free grazing for all horses in use. In the aggregate free grazing adds materially to the use of the Forests by stock, forming perhaps one-tenth of the total.

Of free special-use permits, 2,913 were issued during the year, as against 1,768 the year before. At the close of the year 5,540 were in effect, as against 2,731 in effect during the previous year.

EXECUTIVE FORCE.

The following shows the classification of the Forest force:

Supervisors	113	Expert miners	13
Deputy supervisors	79	Civil engineers	3
Forest rangers	1,148	Superintendents of telephone construction	2
Forest guards	400	Telephone lineman	1
Forest assistants	81	Inspectors of grazing	2
Forest planting assistants	8	Game warden	1
Lumbermen	15	Hunters and trappers	5
Scalers	2	Forest clerks	120
Experts and agents	14		
Forest student	1		
Forest examiners	4	Total	2,012

All of the National Forests except the Choctawhatchee and Ocala, in Florida; the Marquette and Michigan, in Michigan; and the Luquillo, in Porto Rico, were under administration at the close of the year—a total of 193,600,061 acres. Though the number of rangers and guards was 86 more than last year, the average area to each such officer was 125,065 acres, as against 116,665 acres last year. At the same time the demands upon these men were greater than ever before. Proper protection of the Forests as well as provision for the needs of users calls urgently for a larger field force.

No less important than provision for more men to protect the Forests and handle the business is provision for higher pay to those who have proved their right to promotion. Not long ago rangers and

guards needed to be little more than manual laborers. Now the rangers are more and more intrusted with the conduct of local business, often supervising the work of others and called on to exercise initiative, judgment, and tact.

Efficient administration of the Forests depends first of all on building up and maintaining a body of capable and well-trained Forest officers. Since the Forest Service took charge of the National Forests the personnel has gradually but almost completely changed. Of 50 supervisors in office at the time of transfer, only 13 are still in the Service. Some have left to take more attractive employment open to them, many others for the good of the Service; and though a number have proved their efficiency and remain among the most valued of the present Forest force, practically none entered on their work with technical preparation for it. There are now 28 National Forest supervisors and 20 deputy supervisors who have had technical training in forestry, and the proportion of such men is rapidly increasing. But while eventually thorough technical training will be indispensable for all supervisors, a good knowledge of western conditions, combined with integrity, intelligence, and practical sense, is a requirement of first importance. To the men of this character, who are now faithfully and efficiently handling their Forests, the success of the Service as an administrative organization is in very large measure due. They deserve the gratitude, as they have won the local esteem, of the public, for without them a great work could not have been done.

The natural recruiting ground for supervisors is found in the lower ranks of Forest officers. For this reason, as well as because of the increasing responsibilities which fall on rangers and the growing need of special qualifications for their work—such, for example, as a knowledge of elementary surveying and silviculture—the highest efficiency of the present National Forest organization calls for better trained rangers. Both through direct instruction and through co-operation with state colleges and universities to provide for the opening of ranger courses this need was met. Sixteen meetings of supervisors and rangers were held during the year to discuss the best methods of handling National Forest business, 9 of which were attended by representatives of the district offices. The short courses in forestry previously given by the Utah Agricultural College and the Colorado State Agricultural College in cooperation with the Forest Service were repeated, and a similar course was started at the University of Washington. These courses were attended by many rangers and by men preparing to enter the Service. Plans were made for opening the same kind of courses elsewhere.

BUSINESS ORGANIZATION.

The reorganization of the Forest Service forecast in the Report of the Forester for 1908 was successfully accomplished December 1, and the plan of organization has remained as shown on page 37 of that report. The boundaries of the districts were modified later to include in District 1, the Minnesota and Superior Forests, previously in District 2, and the new Marquette and Michigan Forests; in District 3, the new Choctawhatchee and Ocala Forests; and in District 2, the Bighorn and Shoshone Forests, transferred from District 1, and the Bonneville Forest, transferred from District 4.

The beneficial effect of the district organization has been extraordinary. Those in charge of the various lines of work of the Service are brought into much closer contact with the National Forest officers and their work, business is greatly expedited and a higher standard of business efficiency set, a decided stimulus has been given to technical work, and differences with Forest users are more quickly and satisfactorily adjusted. Along with better oversight of the work of the supervisors the new system has brought not a greater centralization of responsibility for the handling of local business, but, on the contrary, an increase in the responsibility laid on local officers. In short, the supervisor is in closer touch with his superior officers, and yet freer to do high-grade work in planning and bringing to pass the best use of the Forest of which he has charge than has ever been the case before. This is believed to be the ideal administrative method for the Service, since it avoids the evils of bureaucratic control on the one hand and irresponsible decentralized administration on the other. A marked gain in the approval by western public sentiment of National Forest work has evidenced the success of the new plan.

Under the method previously used for bringing about a closer touch between the field and office parts of the organization 26 field men detailed from the National Forests took part in the work of the Washington office between July 1 and December 1. After the new organization went into effect the same end was attained by the detail of 53 men from the Forests, for an average period of five weeks, to assist in the work of the district offices.

The depot at Ogden, Utah, for the distribution of materials and supplies needed on the National Forests and at field stations in the West went into operation at the beginning of the fiscal year. It was the forerunner in the westward movement from Washington of work formerly handled there, and through the promptness with which it met the demands for office equipment and supplies required for the district offices was an important element in the immediate success of the new organization. Requisitions from the National Forests were filled with much greater expedition than was ever before possible. The delivery directly to the depot of supplies purchased on contract aided greatly in the successful prosecution of this work.

A system of charging the value of all materials against the executive and administrative offices to which they were furnished was installed, and by this means a comparison was made possible between the amounts used by the different units in the Service.

OBJECTS AND RESULTS OF ADMINISTRATION.

As stated last year, the purposes of National Forest administration are (1) protection against fire and trespass; (2) the harvesting of timber when mature, under such limitations as the need of a reserve for future supplies of timber and the need of watershed protection impose; (3) the maintenance and betterment of a growing crop of timber; (4) the protection of the water supply; (5) utilization of the forage crop; (6) betterment of range conditions; and (7) equipment of the property with adequate means of communication and transportation and with necessary field quarters, in the interest of more effective protection and increased use.

The work of the year along these lines will be outlined under the three heads of forest management, range management, and permanent improvements.

FOREST MANAGEMENT.

STAND, DISTRIBUTION, AND CUT OF NATIONAL FOREST TIMBER.—The total stand of National Forest timber was reported last year as 390,000,000,000 feet. Additions to the total area of the Forests made during the year increased this amount by some 10,000,000,000 feet. This does not include the timber in the two National Forests in Alaska, the amount of which is not known.

The loss of National Forest timber by fire can be given only for the calendar year 1908, since records of fires are not kept by fiscal years. That year was one of prolonged drought during the summer and fall, and of disastrous forest fires throughout the country. The National Forests suffered relatively little. In these, fires burned over 414,638 acres, of which 111,496 acres were timbered, as against 212,850 acres, of which 29,365 acres was merchantable forest, the previous year. About 232,191,000 board feet of timber, or 0.06 per cent of the stand, was destroyed. The value of this timber was estimated at \$415,188, as against \$31,590 for the previous year. A total of 2,728 fires was reported, of which 2,089 were small fires confined as a rule to an area of 5 acres or less. The cost of fire fighting, exclusive of the salaries of Forest officers, was \$73,283.33. This sum, added to the proportion of the total salaries of rangers and guards properly chargeable to patrol and fire fighting, was less than one-twentieth of 1 per cent of the value of the timber protected, estimated at an average stumpage value of \$2 per thousand.

Through cooperation with States and associations of timber-land owners forested areas adjoining the National Forests, from which fire would find entrance into the Forests themselves, were protected. The States of Oregon, Washington, and California commissioned the Forest rangers in those States as fire wardens, and effective aid was given by the Oregon Conservation Association and the Washington Forest Fire Association. Agreements were entered into for cooperative fire patrol and methods of fighting fires with four timber protective associations controlling lands contiguous to the Clearwater, Coeur d'Alene, Pend Oreille, and Kaniksu Forests in Idaho, and a number of rangers on each Forest in that State were made fire wardens. Steps in the direction of similar action were taken in other States, with every prospect of good results. Negotiations were started for cooperative agreements with railway lines for the prevention of fires on their rights of way through the National Forests, and it is anticipated that thoroughly efficient cooperation will be effected early in the ensuing year. Without formal agreements, many of the roads issued more rigid instructions to their employees for the prevention of fires, and their agents were required to notify Forest officers regarding fires when detected by them. In some instances trains were furnished without cost for the transportation of fire fighters. A keen realization by railway officials of the effect of fire in the loss of future business, the danger to their roadbeds from floods and snowslides resulting from the destruction of forest cover, and the loss in scenic attraction was evidenced.

Users of the National Forests whose interests were threatened by fire cooperated with the Forest officers in meeting the common danger. From the most complete reports obtainable it was calculated that the money value of this cooperation during the calendar year 1908 amounted to \$18,114.83. The Forest Service in turn gave aid in the suppression of fires outside of the National Forest boundaries which threatened timber within them to the amount, in the cost of hired labor and fire-fighting supplies, of \$9,057.33.

Estimates showed about 95 billion feet of the National Forest timber to be in California, and 90 billion each in Oregon and Washington. These three Pacific Coast States have therefore about 70 per cent of all the timber. Montana and Idaho have about 35 billion each, or together about 18 per cent. Colorado and New Mexico have about 12 billion feet, or 3 per cent, each. The remaining 6 per cent is scattered in the National Forests of other States.

Of the timber cut under sales during the year, 25 per cent, and of that cut under free use, 27 per cent, came from these other States. Colorado furnished $12\frac{1}{2}$ per cent of the total cut under sales and 13 per cent of that cut under free use, while New Mexico furnished $3\frac{1}{2}$ and 9 per cent. Idaho furnished 10 per cent of the cut under sales and 18 per cent of that under free use, while Montana furnished 24 and 16 per cent. The three Pacific Coast States furnished together 20 per cent of the cut under sales and 17 per cent of that under free use. In other words, the National Forests are being most heavily cut, in proportion to the stand, not where the largest supplies are, but where the need of the community for timber is greatest.

The figures of the cut in board feet, however, place the States in a somewhat different order from that which might be looked for from these percentages, as is shown by the following table:

Timber cut from National Forests.

State or Territory.	Cut under sale.	Cut under free use.	Total cut.
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>
Montana.....	85,766,000	16,767,000	102,533,000
Colorado.....	44,111,000	13,525,000	57,636,000
Idaho.....	34,532,000	18,518,000	53,050,000
California.....	39,445,000	6,885,000	46,330,000
South Dakota.....	29,019,000	4,319,000	33,338,000
Wyoming.....	24,437,000	6,550,000	30,987,000
Washington.....	22,037,000	4,345,000	26,382,000
Arizona.....	21,029,000	4,660,000	25,689,000
New Mexico.....	12,834,000	9,887,000	22,721,000
Utah.....	10,465,000	10,177,000	20,642,000
Oregon.....	10,391,000	6,377,000	16,768,000
Alaska.....	15,550,000	42,000	15,592,000
Nevada.....	2,710,000	1,612,000	4,322,000
Arkansas.....	49,000	879,000	928,000
Minnesota.....		599,000	599,000
Oklahoma.....	59,000	60,000	119,000
Nebraska.....		3,000	3,000
Total.....	352,434,000	105,205,000	457,639,000

TIMBER SALES.—Naturally the extent of the market for National Forest timber depends on the population and industries of each region, the transportation facilities, the amount of timber in private holdings, and general business activity. Timber sales are heavy in Montana because the local demands of a rapidly developing region and of the mines is great, because railroads are available to carry

lumber to the general market in the nontimbered regions farther east, and because there is relatively little timber outside of the Forests. They are heavy in Colorado primarily to supply the mines of the State, and in California because of the diversified demands of that great Commonwealth. But in general the National Forests may be said at present to front the East, while the heaviest supplies lie far to the West and in regions in which vast holdings of private timber are awaiting a market. Timber which brings relatively little now, because it is relatively little needed, but for which there will be a strong demand shortly, neither can nor should be sold too freely.

The opening of the Panama Canal will of itself almost revolutionize the situation. Cuttings which can not now be made in the best way for the welfare of the Forest, because only the relatively high grades of timber can be sold, will then be practicable under much more favorable conditions. Sales of National Forest timber are certain to increase steadily and even rapidly because of the needs of the growing western country, but they should not increase too rapidly now.

The ratio of the cut under sales to the stand in each State shows that in the regions where the demand is greatest and the cutting heaviest the Forests are not overcut. Except in South Dakota, where a disastrous insect attack has forced large sales as a protective measure and to utilize dead or dying timber, and in Nevada, where the scarcity of local supplies has made it absolutely necessary to draw heavily upon them with the expectation of bringing in timber eventually from a greater distance, the cut under sales has in no State reached 1 per cent of the present stand. In Wyoming it was 0.5 per cent, in Colorado less than 0.4 per cent, in Arizona, Oklahoma, and Montana 0.3 per cent, and in Utah less than 0.2 per cent, while in California less than 0.05 per cent of the stand was cut under sales, in Washington less than 0.03, in Oregon about 0.01, and in New Mexico 0.001. The lowest place was held by Arkansas, with 0.0003 per cent.

The sales of timber and the cut under sales (partly made in previous years) were as follows:

Timber sold and timber cut under sales from the National Forests.

State or Territory.	Timber sold.		Timber cut under sales.	
	Amount, board feet.	Value.	Amount, board feet.	Value.
Arizona.....	13, 472, 000	\$18, 785. 11	21, 029, 000	\$40, 972. 29
Arkansas.....	93, 000	164. 09	49, 000	70. 26
California.....	24, 631, 000	48, 543. 44	39, 445, 000	67, 661. 15
Colorado.....	44, 140, 000	75, 568. 91	44, 111, 000	77, 904. 30
Idaho.....	42, 242, 000	98, 035. 37	34, 532, 000	77, 045. 63
Montana.....	30, 706, 000	65, 620. 75	85, 766, 000	207, 229. 75
Nevada.....	4, 408, 000	14, 336. 07	2, 710, 000	8, 718. 36
New Mexico.....	10, 149, 000	18, 326. 71	12, 834, 000	21, 012. 76
Oklahoma.....	58, 000	131. 70	59, 000	163. 20
Oregon.....	30, 236, 000	75, 192. 87	10, 391, 000	16, 333. 85
South Dakota.....	12, 864, 000	19, 280. 51	29, 019, 000	34, 848. 25
Utah.....	7, 057, 000	13, 610. 23	10, 465, 000	18, 563. 72
Washington.....	51, 702, 000	92, 940. 60	22, 037, 000	38, 492. 68
Wyoming.....	8, 298, 000	23, 198. 59	24, 437, 000	59, 298. 76
Alaska.....	6, 610, 000	5, 168. 07	15, 550, 000	9, 469. 39
Total—Fiscal year 1909.....	286, 666, 000	568, 903. 02	352, 434, 000	677, 784. 35
Fiscal year 1908.....	386, 384, 000	736, 024. 97	392, 792, 000	794, 251. 61

These figures show an average stumpage price for 1909 of \$1.98 per thousand, as against \$1.90 obtained in 1908.

The total value of the timber cut under sales as given above is less than the receipts from timber as given on page 11, both because the latter includes the receipts from timber and fire trespass and because payment for timber is required in advance of cutting.

The fiscal year 1908-9 was one of depression in the lumber business throughout the country. For the calendar year 1908 the lumber cut for the whole country was 17.5 per cent less than for 1907. For the fiscal year 1907-8 the timber cut from National Forests under sales was over 100 per cent greater than for the year before, but for the year 1908-9 it was 10.3 per cent less than for 1907-8. This decline was due very largely to the falling off in the demand for lumber in the large distributing centers. From the beginning the Forest Service has handled its sales to meet local demands first of all, and has sold timber for the general market only where this would not jeopardize the future local supply. As a result sales of timber for local consumption continued and even increased slightly during a year in which few sales were made for the general market, and in which several purchasers of timber in large quantities were compelled, like many firms operating outside the National Forests, to suspend operations.

Number and size of sales of timber from National Forests.

State or Territory.	Number of timber sales—					Total number of sales.
	Under \$100.	\$100 to \$500.	\$500 to \$1,000.	\$1,000 to \$5,000.	\$5,000 to \$100,000.	
Arizona.....	800	10	1	1	.....	812
Arkansas.....	13	.....	.....	.....	.....	13
California.....	524	29	7	4	.....	564
Colorado.....	612	36	10	11	3	672
Idaho.....	495	55	10	13	4	577
Minnesota.....	.....	.....	.....	.....	.....	.....
Montana.....	922	23	6	7	1	959
Nebraska.....	.....	.....	.....	.....	.....	.....
Nevada.....	165	6	4	1	.....	176
New Mexico.....	275	10	1	3	1	290
Oklahoma.....	65	.....	.....	.....	.....	65
Oregon.....	97	8	2	4	3	114
Douth Dakota.....	224	12	4	5	.....	245
Utah.....	212	14	4	2	.....	232
Washington.....	36	3	.....	3	3	45
Wyoming.....	83	15	2	2	1	103
Alaska.....	102	8	2	1	.....	113
Total—Fiscal year 1909..	4,625	229	53	57	16	4,980
Fiscal year 1908..	4,585	326	63	71	17	5,062

In the Pacific Coast States, which contain so large a part of the total stand of National Forest timber, sales are made only when a fair price is offered and only under restrictions which safeguard the future welfare of the forest. Both these conditions tend to restrict sales in a region where timber is at present so abundant and so cheap. The depression in the lumber business in Washington and Oregon was shown by a cut 22.8 per cent less in Washington and 10.2 per cent less in Oregon for the calendar year 1908 than for 1907. Nevertheless, the cut of National Forest timber under sales increased last year

61.5 per cent for the State of Washington, and practically trebled in Oregon. The cut in this region, however, is still and probably for some years must be very low in proportion to the amount of timber on the Forests.

In cutting National Forest timber the future productivity of the land was better safeguarded than ever before. The establishment of the district offices in the West made possible closer supervision and better instruction of local Forest officers in marking the trees to be cut. A steady advance in the practice of forestry takes place as the results of the work of past years become apparent and as more technical studies are made. This is especially true in the western yellow pine forests, where the difficulties of securing reproduction are usually great.

Efforts to sell bodies of dead timber before they become total losses were continued with success. So far as possible, sales of green timber were made where the timber was overripe and rapidly deteriorating. In Idaho and Washington especially, there is much timber which is decreasing in stand and in value. In these bodies of timber, sales are especially desirable, and they are being made when logging and market conditions will permit.

Other sales were made to dispose of insect-infested timber. Insect attacks which get beyond control are sometimes far more serious than a great conflagration, and, like fires, they require action to check them while they are still small. Work against insects was carried on in the Black Hills, San Isabel, and Las Animas National Forests. Where timber needed to be cut to protect the Forests could not be sold it was given away. In some cases it was even necessary to cut and peel trees at the expense of the Government. Through cooperation with the Bureau of Entomology it has been learned that the complete destruction of the trees is usually not necessary, but that cutting and peeling and in some cases burning the bark at certain seasons of the year is sufficient.

TIMBER TRESPASS.—A decline in timber trespass is evidenced by the fact that the payments in settlement of such trespasses during the year amounted to \$43,109.39, including \$3,778.04 received for fire trespass, as against \$55,405.76 for the previous year. There is very little timber trespass on Forests which have been under administration for any length of time. Most of the cases are either of trespass committed before the Forests were created or of unintentional trespass. With the opportunity to buy timber from the Government on reasonable terms, the main cause of depredations is removed.

FREE USE OF TIMBER.—The following statement shows a free use of National Forest timber somewhat greater in the number of permits and practically identical in the value of the material, but less in the amount taken, than in the fiscal year 1908. The falling off in amount was due to a year of inactivity in settlement and in mining. The development of prospects by miners in ordinary years takes large amounts of low-priced timber. On the other hand, the demand of farmers and ranchers for the more valuable saw timber and fence-post material was greater than ever before.

Free use of timber on National Forests.

Fiscal year.	Number of permittees.	Cut.	Value.
1909.....	33, 431	<i>Board feet.</i> 105, 205, 359	\$169, 081. 12
1908 ^a	30, 377	131, 976, 840	169, 320. 00

^a Corrected figures, varying slightly from those given in last year's report.

Through free use much dead timber which would otherwise be a total waste is utilized. Green timber formed only 21.4 per cent of the total cut, as against 24.1 per cent in 1908.

Many persons entitled under the regulations to free use found it more profitable to buy their timber from mill men or woodcutters than to cut it themselves. This caused a falling off in free use on some Forests. On the other hand, there was a marked increase in free use along new lines of railroads, especially in Montana and South Dakota.

The setting aside of areas of timber for the free-use supply of communities was vigorously pushed forward and was found to work admirably, both from the standpoints of convenience to permittees and of economical administration. In consequence, settlers desiring timber for the development of unimproved land and prospectors needing timber to develop their claims obtained their timber more readily than before, and the cutting was done where the advantage to the future forest would be greatest.

REFORESTING.—During the year special stress was laid on the work of reforestation. There is much denuded National Forest land, the result of repeated fires and of indiscriminate cutting and grazing in past years, which, unless forested artificially, will not produce timber. To restock artificially the entire unwooded area would involve a prohibitive cost. But the entire area need not be planted. The denuded area remains bare, even when protected from fire, because of the lack of seed trees. Small areas restocked here and there will form islands from which the forest will extend itself naturally until these islands join.

Denuded city or irrigation watersheds, however, are of so great economic and sanitary importance that artificial reforestation is not only economically justifiable, but imperative. The planting and sowing of the year was almost wholly on such watersheds.

Planting or sowing is also called for to try new species. It is believed, for example, that the white pine of the East and the Austrian pine and Douglas fir of the West can be successfully grown in the Black Hills Forest of South Dakota, and that the Jeffrey pine can be advantageously started in some of our southwestern Forests.

The field planting, sowing, and seed collecting of the year are shown below:

Area planted, area sown, and quantity of seed collected on National Forests.

District.	Area planted.	Area sown.	Seed collected.	District.	Area planted.	Area sown.	Seed collected.
	<i>Acres.</i>	<i>Acres.</i>	<i>Pounds.</i>		<i>Acres.</i>	<i>Acres.</i>	<i>Pounds.</i>
1.....	5. 25	89. 75	2, 510	5.....	237	25. 42	279
2.....	265. 76	741. 43	5, 806	6.....	1. 90	65. 45	706
3.....	91. 04	38. 25	1, 941				
4.....	10	165. 50	2, 500		610. 95	1, 125. 80	13, 742

There are in all 24 nurseries on the National Forests, of which all but 9 are small or merely experimental nurseries. The condition of the nurseries at the close of the calendar year 1908 is shown below:

Nurseries on National Forests, close of calendar year 1908.

Nursery.	Forest.	Annual productive capacity.	Ready for planting.
		<i>Trees.</i>	<i>Trees.</i>
Trapper Creek.....	Bitterroot.....	12,800	.....
St. Regis.....	Lolo.....	20,000	.....
Packer Creek.....	do.....	10,000	.....
Elkhorn.....	Helena.....	105,000	.....
Trail Creek.....	Madison.....	48,000	.....
Garden City.....	Kansas.....	300,000	23,000
Halsey.....	Nebraska.....	500,000	257,500
Monument.....	Pike.....	150,000	500
Brown Creek.....	Leadville.....	3,000	.....
Cottonwood.....	do.....	13,000	.....
Hardscrabble.....	San Isabel.....	50,000	.....
Norrie.....	Holy Cross.....	30,000	.....
Gallinas.....	Pecos.....	240,000	22,400
Fort Bayard.....	Gila.....	500,000	149,300
Fort Stanton.....	Lincoln.....	.....	10,000
Frye Canyon.....	Crook.....	.....	4,000
Wasatch.....	Wasatch.....	4,000,000	40,500
Pocatello.....	Pocatello.....	1,000,000	.....
Upper J.....	Manti.....	80,000	.....
Long Gulch.....	Boise.....	15,000	.....
Lytle Creek.....	Angeles.....	500,000	65,000
Las Preitoss.....	Santa Barbara.....	200,000	124,000
Ranger Nurseries.....	Cleveland.....	25,000	15,000
Cerro Alto.....	San Luis.....	1,000,000	10,000
Total.....	.....	8,802,400	721,200

At these nurseries steady progress is being made in working out the best methods of growing the needed planting stock in large quantities. Much experiment is required to meet the problems presented by climatic conditions, fungus and insect enemies, and other difficulties incident to raising economically nursery stock suitable for National Forest planting. The stock must be grown under natural conditions similar to those which they must face when finally set out, if they are to live. Year by year the nursery work reaches a better basis.

The entire stock on hand at the nurseries at the close of the calendar year 1908 consisted of 5,570,925 seedlings and 1,497,400 transplants, of which 3,214,500 were Douglas fir, 1,545,200 western yellow pine, 877,000 jack pine, 440,575 Engelmann spruce, 282,700 Scotch pine, and the remainder of some twenty other species.

INVESTIGATIONS.—As a preliminary to the making of working plans for the management of the National Forests, reconnaissance studies are conducted. These furnish data as to the quantity and character of standing timber, the rate of growth of the different species, the most desirable locations for sales, and the logging methods which should be used. Such information helps both the Forest Service to sell timber to the best advantage and the would-be purchaser to buy. These studies were carried on in the Pike, Coconino, Crook, Lincoln, Manzanita, Pecos, Prescott, and other Forests.

To further scientific investigations of National Forest problems, an experiment station was established near Flagstaff, Ariz., on the Coconino Forest. Results of both scientific and practical value have already been secured. They point the way to the proper method of

cutting yellow pine in the Southwest to secure natural reproduction. This is the most urgent problem of forest management in this great region.

Other problems were attacked by means of permanent sample plots laid out on many Forests. These will secure accurate data through experiment concerning such matters as the re-covering of denuded areas, thinnings and reproduction cuttings, sowing and planting, the introduction of new species, and the best effects of different methods of cutting. A study of natural parks is also under way.

A study just completed of the life history of the lodgepole pine burns of Colorado bears directly upon the management of the extensive lodgepole pine forests, places this pine among the best known forest trees in this country, and has disclosed new methods of investigation.

The encroachment of lodgepole pine on western yellow pine on the east slope of the Cascade Mountains in Oregon was another subject of investigation. It was found that fires and injudicious cutting of yellow pine have enabled the lodgepole pine to crowd out the more valuable yellow pine from a great area, with a very serious resulting decrease in the value of the Forest.

Insect infestations on the National Forests were studied in cooperation with the Bureau of Entomology, and diseases of forest trees in cooperation with the Bureau of Plant Industry.

FOREST ATLAS.—The work of compiling the Forest Atlas was continued in Washington and begun in the district offices. The information gathered from supervisors and the business transacted in each district office, together with the status of lands within National Forests received from local land offices, are now prepared for record and posted in a District Atlas. Duplicate atlas sheets showing the corrections and additions posted are forwarded to Washington. There were assembled into atlas folios 126,877 sheets. The atlas now numbers 160 volumes, as against 70 a year ago. Forty-five folios were prepared for district and supervisors' offices.

RANGE MANAGEMENT.

The relations between the Forest Service and the stockmen are yearly becoming more harmonious. This is due principally to recognition of the fact that a proper regulation of grazing on the Forests has benefited the stockmen, but largely also to the fact that Forest officers have become more accustomed to handling grazing matters. In nearly all the Western States permission to graze sheep on a National Forest is regarded as a valuable privilege, and established stock ranches within and adjacent to the Forests have an enhanced worth for this reason.

The total number of National Forests under grazing administration June 30, 1909, was 139, with a total area of 163,744,706 acres.

RANGE CONDITIONS.—During the fall of 1908 National Forest range conditions were almost everywhere extremely satisfactory. Live stock of every kind left the range in excellent flesh. But the winter of 1908-9 in the Southwest was one of the most severe known for many years. Snow covered the winter grazing grounds to an un-

usual depth and became heavily crusted, forcing the stockmen to feed hay until they faced a hay famine. The spring was fully a month later than usual and very cold. Damaging storms over a large portion of the southern Rocky Mountain region from central Wyoming south caused considerable losses of newly sheared sheep, and later cold weather and lack of green feed caused heavy mortality among the young lambs. Throughout the Southwest the average increase of both lambs and calves was very low.

Every possible step was taken by the Forest Service to relieve the stockmen. Stock were allowed to enter some Forests earlier than usual, but many of the lambing grounds were covered with snow from 2 to 4 feet deep. Some of the Forests were entered fully a month late. Where this happened fees were returned or the fall grazing period was extended. On the Pecos Forest, which had been closed against sheep to protect the watersheds around the head of Pecos River, permission was given to graze 25,000 head of sheep until the outside ranges would support them.

When the cold weather finally ceased, however, the immense snow-fall on the ranges caused a remarkably heavy growth of grass, with plentiful water, and the stock improved rapidly. Except in parts of New Mexico, the condition of the stock on all the National Forests was by midsummer fully up to the average of previous years. The prospects for fat stock of every kind on the National Forests at the close of the season are excellent.

Upon few of the National Forests will any reduction in the number of stock now grazed under permit be necessary. In one or two of the Forests in Oregon and Washington it has been hitherto impossible to reduce the number to the point called for by the welfare of the range without serious injury to the industry. It is believed, however, that this will be remedied during the coming year, for the stockmen themselves are beginning to realize that one dry season may entail great loss.

Last fall a committee composed of representatives of this Service, the Reclamation Service, and interested stockmen investigated in the field the question of sheep grazing on the Tonto National Forest. At that time a certain number of sheep were allowed to graze on small areas within the watershed of the Salt River, with the understanding that if advisable they should be kept off after giving the owners sufficient notice. The results during the past year have caused the Reclamation Service to request that sheep be wholly excluded from these areas, and it will therefore be necessary to notify the stockmen that this must be done.

GRAZING TRESPASS.—There were 358 cases of grazing trespass, upon 86 of the National Forests. Of these, 181 cases of innocent and 125 cases of willful trespass were amicably adjusted by payment of the damages sustained; 42 cases, most of which occurred too late to be settled within the fiscal year, are pending settlement, and 10 cases were taken into the courts.

ADVISORY BOARDS.—There were recognized 17 new advisory boards of local stock associations. The total number of such advisory boards is now 46. The advisory boards work in close cooperation with the local Forest officers, and settle many perplexing and complicated range questions. In nearly every instance the findings of the ad-

visory board have been satisfactory both to the Service and to the stockmen.

The arrangement made last year through the advisory boards of the Snake River Stock Growers' Association of Colorado and the Carbon County Wool Growers' Association of Wyoming for sheep grazing on a large area of the Routt National Forest has enabled the sheep men to use these ranges in peace and in full harmony with their neighbors.

Properly organized and representative boards mean a more adequate understanding of the needs of the stock owners, greater ease of handling the work, better use of National Forest ranges, and a reasonable degree of home administration. It is the earnest wish of this Service to encourage such organization of all users of National Forests.

PERMITS.—On the Nevada and Zuni National Forests, and upon additions to older Forests, created after March 1, stock belonging to regular occupants of the ranges were allowed to graze free, without permit, during the season. Pay-grazing permits were issued as follows:

Pay permits for grazing on National Forests.

State or Territory.	Cattle, horses, and hogs.				Sheep and goats.		
	Permits issued.	Cattle.	Horses.	Hogs.	Permits issued.	Sheep.	Goats.
Arizona.....	1,599	225,181	10,765	425	195	491,040	21,090
Arkansas.....	27	541	18	176	1	.....	19
California.....	2,808	168,308	8,715	3,535	312	340,534	20,348
Colorado.....	3,162	273,499	10,183	.....	410	642,745	3,726
Idaho.....	2,116	112,511	7,593	.....	848	1,782,978	.....
Kansas.....	96	13,598	230	.....	1	356	.....
Montana.....	2,049	144,080	15,950	.....	236	598,510	790
Nebraska.....	74	30,440	959	.....	.....	.....	.....
Nevada.....	334	49,911	5,014	.....	59	433,946	.....
New Mexico.....	2,137	124,312	7,309	252	748	476,118	93,723
Oklahoma.....	33	4,345	153	20	.....	.....	.....
Oregon.....	1,740	132,626	10,678	93	615	1,047,406	200
South Dakota.....	496	11,624	1,628	.....	.....	.....	.....
Utah.....	4,449	118,059	6,799	.....	1,283	905,446	.....
Washington.....	362	12,267	1,014	.....	100	176,659	.....
Wyoming.....	681	70,083	3,011	.....	266	783,960	.....
Total.....	22,163	1,491,385	90,019	4,501	5,074	7,679,698	139,896

The above is an increase of 187,243 cattle, 14,016 horses, 2,425 hogs, 718,779 sheep, and 13,704 goats over the previous year. In addition, free permits to graze 24,626 cattle, 2,826 horses, 33,005 hogs, 2,038 sheep, and 1,812 goats were issued to 5,109 users of the Ozark and Arkansas Forests, under special fire-fighting agreements. The increased number of stock grazed shows a very satisfactory improvement in the Forest ranges under proper regulation. The average number of cattle and horses to each permit was 71, and of sheep and goats 1,541, as against 70 and 1,655 last year. The reduced number of sheep and goats to each permit is due to division of grazing privileges among all applicants entitled to recognition. The receipts for grazing fees on account of the above permits, given on page 11, show an increase of 6.4 per cent over those of last year.

The successful working of the plan to allot grazing privileges for a five-year period, put into effect upon 7 of the Forests last year, led to its extension to 19 more Forests. This plan, originally initiated at the request of the stockmen, that their business might have greater stability, has given such good results that it will probably be applied to all National Forests as soon as the range divisions have been satisfactorily adjusted and the true carrying capacity of the ranges has been found.

Seven per cent of the approved applicants failed to use their permits, as against 8 per cent during the three preceding years.

There were issued 2,107 crossing permits, which allowed 55,901 head of cattle and horses and 4,131,190 head of sheep and goats to be driven across National Forests. This was an increase in permits of 45 per cent and in stock of 27 per cent. No charge is made for these permits, and no permits are required for small bands of stock which are driven along public highways, or which are not to be grazed upon the Forests en route. Every possible facility has been provided to enable stock to cross National Forest land in passing to and from their customary ranges, and to shipping points, without delay. The movement of stock across the Forests is practically unhampered, while Forest interests are entirely safeguarded.

There has been a noticeable gain in the number of paid and free permits allowing the construction and maintenance of pastures, drift fences, corrals, reservoirs, and other range improvements. The National Forests are the only parts of the public domain upon which these incidental uses of the range, so essential to the proper management of the range-stock industry, can be legally secured. The necessary inclosures and fences are maintained upon payment of fees lower than the tax rates would be on privately owned lands. Without such privileges National Forest stock raisers would have to invest large sums in patented lands.

USE OF STATE LANDS.—The cooperative agreement with the States of Utah and South Dakota mentioned in last year's report devolves upon the Forest Service the regulation of grazing upon lands of these States lying within National Forests. In Utah the agreement was modified by the fixing of a minimum percentage of revenue to the State, and 49 permits were issued which authorized the grazing of 599 cattle and horses and 4,655 sheep and goats upon certain of the Forests on account of the State. Other States are considering similar agreements.

Where National Forests surround small bodies of land, title to which is vested in one of the States, as for example in the case of school sections 16 and 36, a State wishing to derive a revenue from the lease of such lands for grazing purposes is not able to do so to advantage because they are scattered. In leasing such land, protection of the productive power of the range and the forest is desirable from the standpoint of the State's interest. The Forest Service is already on the ground with an administrative system designed to meet these ends, and can easily apply this system to all lands within its boundaries. Under the cooperative agreements the State pays its quota of the cost of grazing administration on the combined state land and National Forests area, and issues orders for the same quota of the total number of stock permitted to graze on this area.

USE OF PRIVATE LANDS.—OWNERS or lessees of private grazing lands within National Forests may, if they so desire, exchange the right to graze their own land exclusively for free permits admitting to the Forest the number of stock the land will support under the Forest Service regulations. Thus holders of grazing rights on scattered or unfenced interior lands can graze their fair quota of stock on the range without the heavy expense to prevent trespass on the Forests to which they would otherwise be put. At the same time the best as well as the fullest use of the range is promoted. Private owners who prefer to use their own land exclusively are given free access to it through crossing permits when the land can not be reached by public highway; but the stockmen last year commonly chose the privilege of exchange. There were issued 1,157 such free permits for 51,912 cattle and horses and 295,162 sheep and goats in exchange for the right to graze 1,513,608 acres. On the other hand, 57 permits allowed 5,595 cattle and horses and 12,864 sheep and goats to cross into interior holdings, the right to exclusive use of which had been retained. The acreage, number of permits, and amount of stock under the exchange plan were all greater than the previous year.

Under a cooperative agreement with the Atchison, Topeka and Santa Fe Railroad Company similar to the agreements with the States of Utah and South Dakota already described, 26 permits issued upon certificates from the land commissioner of the railroad allowed the grazing upon the Manzano Forest of 165 head of cattle and horses and 7,513 head of sheep and goats, for which the company received the fee. These figures represent the net quotas and returns to the company after deduction of its share of the administrative expense.

PROTECTION AGAINST DISEASE.—The enforcement of quarantine regulations upon the National Forests in cooperation with the Bureau of Animal Industry continued as in preceding years, with effective and entirely satisfactory results. The relations of the two Bureaus have been exceptionally good, and the assistance rendered to the Forest Service was of great value to users of the National Forests.

Scab among the sheep and mange among the cattle were fought in certain of the States and Territories by requiring the stock under permit to pass the inspection of the Bureau before entering the Forests. The number of States in which an inspection of sheep was required was smaller than last year, and with strict enforcement of quarantine regulations it is probable that the National Forest ranges will soon be practically free from scab. The mange among the cattle is confined to so small an area in the Southwest that it is now practically local.

In Wyoming, at the request of the state authorities, the Bureau of Animal Industry took charge of an outbreak of lip-and-leg disease among sheep. The Forest Service cooperated by requiring inspection and a certificate of freedom from this disease for all sheep entering certain Forests.

In southern California, through the efforts of the Bureau of Animal Industry, the Texas-fever tick, which at one time infested almost every portion of the National Forests in the region, is now practically exterminated. It is hoped that one more season will completely eradicate this trouble from all the National Forests in that State.

The demand for blackleg vaccine has been less this year than for the two years past, but many requests for vaccine are received from Forest users. The use of vaccine, obtained through the Forest Service from the Bureau of Animal Industry, has been followed by an appreciable reduction in the losses from this disease on the National Forests.

The Forest Service has also worked in harmony with the stock sanitary boards of the various Western States in enforcing state quarantine regulations.

PROTECTION AGAINST WILD ANIMALS.—The following animals were destroyed within and immediately adjacent to the National Forests by 51 Forest rangers and guards, detailed to this work for an average period of one hundred and seven days:

Wild animals destroyed.

State or Territory.	Bears.	Lions.	Wolves.	Wolf pups.	Coyotes.	Wild-cats.	Lynxes.
Arizona.....	5	56	2	.....	256	192	.....
California.....	31	8	1	.....	202	38	.....
Colorado.....	.....	3	1	.....	73	11	1
Idaho.....	16	.....	19	3	1,178	84	13
Montana.....	21	.....	44	41	491	68	35
Nevada.....	.....	.....	.....	.....	45	14	1
New Mexico.....	14	28	64	7	322	116	30
Oregon.....	8	.....	8	.....	246	11	.....
Utah.....	8	1	.....	.....	331	37	1
Washington.....	3	.....	.....	.....	8	.....	.....
Wyoming.....	2	.....	5	11	143	.....	.....
Total.....	108	96	144	62	3,295	571	81

The value of the stock which these animals would have destroyed in one year, as estimated by the Biological Survey and by experienced stockmen, is at the lowest figures not much less than the total amount paid for grazing privileges during the year. It was impossible to meet the demand for hunters.

Prairie dogs were practically exterminated on large areas of Forest in Colorado, New Mexico, and Arizona, and it is anticipated that the land will shortly become productive of forage grasses and plants. Most of the Forests in the infested regions now have at least one man upon them who is versed in the work and can be assigned to it during the periods when it is most effectual. A widespread interest and readiness to assist has developed among stockmen.

PROTECTION AGAINST POISONOUS PLANTS.—In cooperation with the Bureau of Plant Industry, investigations of loss by poisonous plants were conducted upon a number of Forests. Many permittees were advised of the presence of dangerous plants and enabled to avoid loss. The poisonous properties of chokecherry leaves were determined. Experiment in the eradication of poisonous plants by various methods was practically confined to the Manti Forest, where the use of the range is very intensive. A botanical survey of a considerable part of this Forest secured valuable data. The work had a direct economic value.

FORAGE AND PASTURE INVESTIGATIONS.—The investigations of the year in reseeded overgrazed areas and introducing more valuable

forage plants, carried on in cooperation with the Bureau of Plant Industry, comprises an extensive series of experimental studies upon the Wallowa Forest in Oregon, observations of several experimental plats in the Manti Forest in Utah, studies of the reseeding possibilities of alfalfa and best methods of seed collection, and range examinations in several of the Forests. Many of the supervisors and rangers are conducting seeding experiments upon small areas. The benefits of the discovery of methods to restore western ranges to their former state of productiveness will extend far beyond the limits of the Forests.

The coyote-proof pasture in the Wallowa Forest, described in last year's report, demonstrated the practicability of fencing as a method of range utilization in high mountain ranges. It lowers the cost of handling, increases the carrying capacity of the range, reduces the rate of loss, and insures an increased lamb crop, heavier lambs, heavier mutton sheep, and an increase in wool production.

An experiment in the use of goats to open areas of chaparral was begun shortly before the close of the year on the Lassen Forest, in California, under a cooperative agreement with a goat breeder of that vicinity. The Forest Service allows the free grazing of 3,000 head of goats for a period of two years, while the permittee agrees to cut trails through the brush and pasture his goats in accordance with instructions. If successful, this experiment will greatly reduce the cost of forest planting on burned-over areas grown up to brush, while it holds out to goat breeders the hope of a possible solution of their present inability to get range.

GAME PRESERVES.—The extermination of noxious animals and complete protection of game upon the Wichita and Grand Canyon national game preserves has caused large increases in the number of the game birds and animals.

The Forest Service is cooperating with the Biological Survey in the construction of the fence around the bison preserve near Ravalli, Mont., but this preserve is to be entirely under the administration of the Biological Survey.

PERMANENT IMPROVEMENTS.

The fund appropriated by Congress for permanent improvements on the National Forests was \$600,000, an average of about \$4,000 to each Forest, and less than one-third of the amount called for by estimates of the supervisors. The need of trails, roads, bridges, and telephone lines in new and unsettled country, and of buildings to house the Forest officers, was very great. Many urgent projects had to be postponed for lack of money.

The construction work completed during the year comprised 1,670 miles of trails, 237 miles of roads, 1,418 miles of telephone lines, 64 bridges, 776 miles of pasture and drift fences, 43 miles of fire lines, and 528 cabins and barns. The maintenance of improvements drew appreciably from the fund, since trails and telephone lines in rough and wooded country require many repairs each year after the heavy winter storms.

Cooperation with States, communities, and individuals in the construction of roads, trails, bridges, telephone lines, and fences made possible a much larger increase of facilities than could have been

provided from the Congressional appropriation alone. For example, a wagon road of 17 miles on the Coeur d'Alene National Forest in Idaho, built in cooperation with the county of Shoshone and the city of Wallace, cost approximately \$20,000; the county contributed \$10,000, the city \$4,000, and the Forest Service \$6,000. In southern California the citrus-fruit associations taxed the boxes of fruit shipped through their exchanges to raise cooperative funds for trail and fire-break construction on Forest watersheds which supply their members. Water companies and boards of county supervisors made contributions, and individual ranchers gave either money or work. The total amounted to \$8,840, including \$624 from the State of California, and the supervisor was obliged to refuse further offers because funds were not available for the Forest Service's share.

The value of fire lines was shown in southern California. One stopped a serious fire without human help, and another prevented a dangerous valley fire from extending into the mountains.

Part of the permanent improvement fund was used for drift fences, pastures, corrals, sheep bridges, reservoirs, counting chutes, and other miscellaneous range improvements which increased the carrying capacity of the ranges and gave them greater value to the permittees. In a part of this work stock associations and individual permittees cooperated. The fund apportioned to this line of work is entirely inadequate to meet the demands of the users of the different Forests.

FEDERAL COOPERATION.

In accordance with the agreement entered into between the Secretary of the Interior and the Secretary of Agriculture on January 22, 1908, as reported a year ago, forest work on the Indian reservations was throughout the year under the charge of the Forest Service. The aims of the agreement were to protect the great amounts of timber now standing, and worth some \$75,000,000; to secure to the Indians the full value of timber sold through oversight of all lumbering operations and sales; to determine upon what lands permanent forests should be maintained; and to provide for the systematic care and improvement of the forests on such lands. It was provided that all salaries and other expenses of the work should be borne by the Indian Office, which was also to prescribe the policies to be followed in all matters affecting the welfare of the Indians, as, for example, the employment of Indian labor and protection of the Indians from intoxicants. All the direction of and responsibility for forest work was placed upon the Forest Service.

Work under this agreement was carried on throughout the year, but could not be extended to all of the reservations with forested areas because the Indian Office found itself unable to allot the necessary funds. On the Bad River, Flathead, Grand Portage, Lac Courte Oreille, Lac du Flambeau, Leech Lake, Menominee, and Red Lake reservations 190,000,000 feet of timber, worth over \$1,000,000, was cut under the supervision of the Forest Service. On the Klamath, Pine Ridge, Rosebud, and San Carlos reservations timber cuttings made by the Indians for their own use and for agency purposes were supervised, with a large saving of unnecessary waste.

Fire patrols were organized on the Coeur d'Alene, Klamath, Menominee, Pine Ridge, Rosebud, and San Carlos reservations. In August and September, 1908, the most disastrous fires for many years

visited the Lake States region. On all sides of the Menominee Reservation in Wisconsin forest fires swept across the country, but the protective force organized by the Forest Service fought and kept back every fire which came near the reservation lines, so that there was practically no damage from fire on the reservation. On the Coeur d'Alene Reservation, in Idaho, a bad fire, with a front of 6 miles in an inaccessible country, was extinguished after thirty days' work. In the spring of 1908, before a protective force was organized, fires did over \$70,000 damage on the Pine Ridge Reservation. A patrol system was established on this and the Rosebud Reservation in the spring of 1909, and practically no timber was destroyed.

On the Menominee Indian Reservation a sawmill of 100,000 feet daily capacity, constructed under the supervision of the Forest Service, began to operate on February 1, 1909. On June 30 about 10,000,000 feet of lumber had been manufactured from the logs cut from blown-down timber. Radical changes in the logging and business conduct of a large lumbering operation, in progress when the Forest Service took charge, were made with a view to reducing waste. Plans for the conservative logging of other portions of the reservation were completed.

Examinations were made of forest lands within the Coeur d'Alene, Flathead, Hoopa Valley, Klamath, Lac Courte Oreille, Leech Lake, Nez Perce, Northern Cheyenne, Qualla, Red Lake, Siletz, and Spokane reservations, and planting plans were outlined on five reservations in Oklahoma.

Soon after the close of the fiscal year the Indian lands cooperative agreement was terminated by the Department of the Interior.

Examinations of timber reservations were made, plans of management prepared, or timber sales supervised for the War Department at Forts Meade and Wingate, Picatinny Arsenal, the Presidio of Monterey, and Middle Point, Tillamook Head, Three Tree Point, Saunderson, and Sturgeon Bay Military reservations; for the Navy Department at Charleston and Norfolk navy-yards; and for the Department of Commerce and Labor at Bois Blanc, Cheboygan, and Grand Marais Light-House reservations.

STATE COOPERATION.

State cooperative work increased during the year. In New Hampshire the study of forest taxation, begun in the spring of 1908 in cooperation with the State Forestry Commission, was completed. This was the first thorough study of the actual working of present methods of taxing forest property ever made in the United States. A tax law was worked out, but did not pass the legislature. The report also dealt with the efficiency of the fire laws and made recommendations which were in the main adopted by the state legislature.

The study of forest conditions in Kentucky, begun in the summer of 1907 in cooperation with the state board of agriculture, forestry, and immigration, was continued through the season of 1908. Approximately 12,000,000 acres have been examined and mapped since the work began. A proposed forest law for the State was prepared.

A preliminary examination of forest conditions in Alabama, made in cooperation with the state commission of forestry, included a description of the forest conditions by regions, a discussion of the

different forest problems in the State, and detailed recommendations for the improvement of the present fire laws, the appointment of a state forester, the restriction of turpentining, the regulation of lumbering operations, and a general forest policy for the State. A similar study was made in Florida. In Illinois a study made in cooperation with the State Laboratory of Natural History investigated forest conditions in typical regions of the State, worked out plans for the perpetuation of the forest types, and developed the essential features of forest legislation needed in the State.

In Michigan cooperation with the State Forestry Commission procured a rough estimate of the standing timber, the proportions of cut-over, cleared, and forest land, and the extent and seriousness of recent forest fires, in the light of which the fire and tax laws were discussed and recommendations for state and private forest reserves were made. State cooperation with Oklahoma resulted in a preliminary study of existing timber resources and the field for forest planting, and with Utah in the supervision of some timber sales on state land within National Forests.

Cooperation with States in the regulation of grazing on state lands within National Forests has already been reported on page 25.

As the policy which governs National Forest administration has become more clearly defined in practice and better understood by the western public, a wide field for cooperation begins to appear. The Forests are maintained not to serve a federal interest unrelated to or in conflict with the interests of individual States, but to serve the national interest through a work which from first to last directly furthers the welfare of western communities and States. The field is one which creates a true partnership of interests. Because of the interstate relations and the national scope of the problems involved it pertains to the Nation, yet it concerns fundamentally the best use of the natural resources of each State.

State lands within National Forests are one illustration of the opportunity for such a partnership, which, however, should not be regarded as confined to the state holdings merely. Broadly speaking, the interests involved are the same whether ownership of the land rests with the State or the Nation. The same opportunity to serve the public welfare exists in either case, and the best use of one should be the best use of the other also. By a joint management which safeguards the right of both the State and the National Government to exercise their proper prerogatives, but in a spirit of hearty cooperation for a common end—the welfare of the people—a wise, efficient, and economical administration of the land which, whether state or national, belongs to the people, should be possible.

An obstacle in the way of working out plans for such cooperation with some of the States is created by a legal question which has come up as to the ownership of certain lands. The enabling acts of North Dakota, South Dakota, Montana, Washington, Idaho, Wyoming, and Utah, in connection with the grant of land for the common schools, reserved for school purposes sections 16 and 36 (in Utah 2, 16, 32, and 36), whether "surveyed or unsurveyed." By several decisions of the Secretary of the Interior (the latest of which was rendered September 30, 1909) it has been held that, where school sections are included within a National Forest before approval of survey, the title thereto will not vest in the State until the reservation is extin-

guished, the State, meanwhile, having the right to select an equal area elsewhere as indemnity. The first part of the Secretary's ruling upon the law is disputed by some of the seven States above mentioned, and a final determination of the matter can, of course, be had only through the courts. In the meantime the Forest Service is specifically bound by this last decision to regard the title to the land as still in the Government, and to administer the land accordingly.

Presumably Congress will grant some measure of relief if the contention of the States falls. Whether this relief should take the form of an actual grant of all the school sections, of a right to some more advantageous form of indemnity selection, or of exchange for a solid body of present National Forest lands, will of course be for Congress to decide.

Other fields for cooperation between the Forest Service and the States include joint action in dealing with the forest-fire problem, joint enforcement of the game laws and provision for the increase of game where this is desirable, and joint action to stamp out disease among stock through enforcement of sanitary regulations prescribed by state boards. Indeed, the field is capable of almost indefinite expansion.

GENERAL INVESTIGATIONS.

The public welfare requires that we should know both how to make all forests, public and private, produce the most of what we need and how to make the most of what our forests produce.

The first end is the aim of silviculture. Like field crops, the forest crop responds in character and amount to the cultural treatment given it. To bring about better forest culture the Forest Service studies the conditions which govern the character and rate of forest growth throughout the United States. It also, to promote the best use of the material which the forest puts at our disposal, studies the uses to which this material is or might be put. Under these two heads, silvical studies and studies of forest products, falls the general investigative work of the Service.

SILVICULTURAL STUDIES.

Through cooperative work with private owners the Forest Service gathers practical information concerning forest management and planting for general use. There were made 92 field examinations of about 700,000 acres of private forest lands in 26 States. New applications were received from 61 private owners in 23 States. A working plan was made for 75,000 acres of coal company forest land in the Birmingham district of Alabama. The company, which uses nearly 20,000,000 board feet of timber annually, desires to manage its land for a sustained yield. There were made planting plans for about 3,000 acres of private land in 8 States. In cooperation with private owners, a study of the possibilities of the eucalypts was made in southern Texas.

Cooperative experiments in nursery and planting work were carried on with 5 state experiment stations, with Berea College in Kentucky, with 2 state foresters, and with the forester for Hawaii.

These experiments seek to determine the trees best adapted to regional use. Among the most important experiments is the sowing in Maryland of loblolly pine, a tree of great promise for reforesting sandy land in the Central Atlantic and Southern States.

A study of the effect of wind-breaks on farm crops covered the States of Nebraska, Kansas, Iowa, and Minnesota, and obtained results which apply to a great extent also to the Lake States, the Northwest, and the Southwest. It was proved that in the absence of natural barriers to check the wind's force and within certain limits of width, wind-breaks pay for the ground they occupy by causing an increase in the yield of crops to their leeward. Studies of cypress and the various species of ash furnished information regarding the present stand, annual consumption, growth, yield, reproduction, and proper management of these forest trees.

A plan for volunteer observations on the time of leafing, blossoming, and fruiting of the most important trees of the United States enlisted more than 2,000 teachers as local observers. These observations will contribute in an entirely novel way to our knowledge of climatic conditions. They are really meteorological observations, in which the life processes of trees furnish the record. Such observations furnish a means of deciding what kinds of trees are suited to any locality.

Seed testing during the year included tests of the seed collected by the Forest Service in 1908, tests of various methods of germination, tests of seed samples placed in storage in 1906, the preparation of samples for a new series of storage experiments, and a few tests of seed samples for private persons. The results obtained have immediate practical utility for the National Forest planting work. Twenty-nine silvical leaflets were prepared and published.

Study of the characteristics of pine resins in cooperation with the University of North Carolina, concluded during the year, secured further data of value to the turpentine industry. The forest herbarium and wood collection were considerably increased, and the distribution of North American trees was more fully studied and mapped.

STUDIES OF FOREST PRODUCTS.

While silvical studies aim at increasing the productive power of the forest, the studies of forest products aim at economy in the use of what the forest creates. With better use a given amount of raw material goes further. The practical result is the same as though the forest had been made to produce more. Waste of wood material in the United States is very great. Through preventable decay, ignorance of the physical properties or best methods of handling different kinds of timber, and other causes, the wood fails to render its best service, and the result is an unnecessary drain on the forest. There is also a heavy loss in wood which is destroyed through decay or other natural causes in the forest itself. Altogether, though we grow yearly only one-third the wood we use and are nearing the end of the surplus which is drawn upon for the other two-thirds, we give far too little heed to economy of use.

The Forest Service seeks to promote economy of use, first, through learning and making known the actual situation as to demand and

supply of forest products; and, second, through investigations to discover how forest products may be put to better service. To the extent that a profit can be secured from what is now wasted, the returns to the forest owner are increased and investment in the business of producing timber is made more attractive. The effect of discoveries of this kind is both to cheapen the present selling price of the primary product and to broaden the opening for forest management.

The general problem of promoting the best use of wood gives rise to three classes of studies: Studies of present supplies, consumption, uses, markets, and prices; studies of the natural qualities of wood and of methods of handling and using it, that it may give better service; and studies of waste and its possible reduction or utilization.

STATISTICAL AND MARKET STUDIES.

The first necessity for wise use of our forest supplies is accurate knowledge as to what there is, how fast and for what purposes it is used, what it brings, and how fast it is being reproduced. Although our knowledge of these facts is still far from satisfactory, each year has marked a distinct advance toward certainty as to where we stand. The statistical work of the Forest Service has had a far-reaching effect in bringing lumber and other manufacturers into hearty sympathy with the Service and in giving them a better understanding of the meaning of forestry. In almost all important association meetings of the wood-producing or wood-using industries discussions of forest problems now occupy a prominent place. The principal manufacturers or users in every line report their production or consumption promptly, recognizing the value to them of the statistics gathered.

Annual statistics of forest products are collected in cooperation with the Bureau of the Census, with the assistance of the National Lumber Manufacturers' Association. The Bureau of the Census keeps the lists of names, sends out the schedules, and tabulates the replies. Bulletins interpreting the results are written in the office of Forest Statistics and published by the Bureau of the Census.

About 52,000 schedules sent out covered forest ownership and protection, forest taxation, mill operations, forest areas, forest fires, forest planting, production and uses of timber, forest cover and water supply, the use of wood for fuel, and related subjects. The returns from these, supplemented by those from 48,000 schedules upon firewood, post, and rail consumption mailed by the Bureau of Statistics and tabulated by the Bureau of the Census, together with information already in the Service files, furnished information which was embodied in papers for the report of the National Conservation Commission. The material secured will also be used in a number of Forest Service publications.

The kind and quantity of wood preservatives used in the United States was learned for the first time through inquiries sent to all the wood-preserving plants. The replies showed that 57,000,000 gallons of creosote were used in 1908, of which two-thirds was imported.

An attempt was made to compile a complete statement of the loss by forest fires last year, but it was found impossible because few of the States have any adequate provision for recording or preventing forest fires.

A special inquiry made in cooperation with the National Hickory Association into the annual consumption of hickory yielded valuable though incomplete information and laid the basis for fuller inquiry next year.

A study of the relation of the tariff to the lumber industry led to conclusions which were presented by the Forester to the Ways and Means Committee of the House of Representatives on February 24 and later summarized in a letter to the chairman of the committee.

On July 1, 1908, the Forest Service began to publish a monthly wholesale price list of lumber in twenty of the principal markets of the United States. Previously no authoritative record of the selling prices existed and the lumber industry was the only important industry of the country without such a record for its product.

This record is needed in the interest of the lumber trade itself, but still more in the interest of the public. The lumberman occupies a somewhat peculiar position. He supplies a public necessity under conditions which make combination for a monopoly profit increasingly possible as the supply dwindles. To promote cutthroat competition means the promotion of wasteful use and of the exhaustion of supply, but diminished competition means danger of extortionate prices. Both present and future must be provided for; neither should be unduly sacrificed to the other. The only alternative to public ownership of all forests as the means of escape from ill-considered reduction of the supply on the one hand and unreasonable charges on the other is publicity and, where necessary, regulation in the public interest. Progressive lumbermen are themselves coming to recognize the need of Government regulation of their business. If the public interest is to be fully served the end sought must be neither too cheap prices through destructive competition nor extortionate prices through monopoly control of forests for private profit, but fair and reasonable prices, taking account alike of the present, the future, and the rights of owners. In securing and publishing the figures of lumber prices the Forest Service is creating the means of judging whether the public is fairly treated, so that if the need for action arises measures of regulation may be applied intelligently.

The work is now on a firm basis of cooperation with the wholesale lumbermen. A few markets are yet to be added to round out the work for the entire country. To give it its maximum value to the public and to the lumber industry, it is desirable to bring out the prices at the mill for representative grades and for mill run of lumber for the leading commercial woods. Plans have been made to obtain and publish this information quarterly. The mill prices include cost of stumpage, cost of manufacture, and profit of the manufacturer. The wholesale prices include, besides these items, the cost of transportation, handling in the market, and profit of the wholesaler. The two together will give the basis for a complete analysis of the cost of manufacturing, handling, and selling lumber.

To take its part in solving the problems connected with the better utilization of our forest products, the Forest Service must keep in touch with and abreast of the industries which use wood. To bring this about studies are made of the chief lumber markets of the country and of the wood-using industries, in order to know their requirements as to quantity, form, and kind of wood. In the West this work has been carried on with especial reference to the products of

the National Forests. Plans have been made for systematic cooperation with several States. The work both locates the problems of the wood-using industries, in so far as they relate to timber supply, and aids the State to formulate a wise timber policy by showing how much wood must be produced to keep the industries going.

The study of wood uses is being gone into fully. This project covers the past, present, and prospective uses of the commercial timbers of the United States, with their sources of supply, quantities available, and waste. Special attention is also given to the properties which fit woods for particular purposes. Eighteen important and thirty-four minor species have been covered.

WOOD PRESERVATION AND TIMBER TESTS.

A most striking advance took place during the year in protecting wood against destructive agencies. By treatment with preservatives, such as creosote and zinc chlorid, wood is made to a greater or less degree immune from fungi, insects, and marine borers. These now destroy annually some 8,000,000,000 feet of timber in the United States. During 1908 57,500,000 gallons of creosote and nearly 19,000,000 pounds of zinc chlorid were used in treating timber, a great increase over any previous year. Probably 1,375,000,000 board feet were treated, or about 15 per cent of the timber which should be treated. The number of treated ties in 1908 was 23,776,060, against 19,856,000 in 1907, although 27 per cent less ties were used. Preservative treatment is making possible the use of many woods neglected in the past. This means the saving of the more valuable timbers for better uses.

Corresponding to these gains, interest in timber treatments has broadened to all parts of the field. Railroads, telephone, power, and mining companies, and even small users like farmers, are coming to regard preservative treatment as a necessity.

The Forest Service has had a notable part in this advance. The greater amount of its work has been to make known to the public the practical value of preservative treatments. To demonstrate the practicability of treating National Forest timbers, small plants were operated for a part of the year on the Holy Cross and Black Hills National Forests. The Black Hills plant was taken over during the year by the Homestake Mining Company, enlarged, and put into commercial operation under Forest Service supervision. Timbers for permanent telephone lines and fences on the Forests are treated by the Service. Inexpensive plants for small users were designed and put to trial in several places for treating fence posts and shingles. Treated fence posts were set in experimental lines to test their comparative value. In this work the Service cooperated with excellent results with the experiment stations of Maryland, Iowa, and South Carolina, the University of Minnesota, the Bureau of Plant Industry, and the firm of S. Jacobs & Sons, Brooklyn, N. Y.

In similar manner, but on larger scale, the Service cooperated with mining, railroad, telephone, and lumber companies, the cooperator paying all expenses of the work, including salaries, while the Forest Service furnishes the men and reports the result.

Plants were designed, installed, and experimentally operated and timber policies recommended for the Philadelphia and Reading Coal

and Iron Company, the Coal Mining Department of the Delaware, Lackawanna and Western Railroad Company, the Hercules Mining Company, at Wallace, Idaho, and the Bunker Hill and Sullivan Mining and Concentrating Company, at Kellogg, Idaho. The Philadelphia and Reading Coal and Iron Company, on the advice of the Service, installed twelve portable sawmills to saw sound lumber from partially decayed mine timber formerly burned as useless, at a cost of about \$15,000 and with a saving of several thousand dollars per month. Treating plans, some of which are now in effect, with the prospect of an important saving in wood consumed, were formulated for the H. C. Frick Coke Company; the Spring Valley Coal Company, of Illinois; the Tennessee Coal and Iron Company; the Indianapolis, Columbus and Southern Traction Company; and the North Louisiana Telephone Company.

In cooperation with the Great Southern Lumber Company, of Bogalusa, La., the Forest Service sought means to prevent, by the application of chemicals, the sap-staining or "bluing" of freshly cut lumber, which costs southern lumber companies more than \$6,000,000 annually. A treatment was found which appears to be of value, and its commercial application is now being worked out. A plant was also designed for this company to enable timbers, such as poles, ties, and piling, to be given a preservative treatment as a part of the lumber operation.

Investigative work in cooperation with five electric light, railway, and power companies in southern California worked out methods of handling and preserving western yellow pine and red cedar poles, together with designs for a commercial pole-treating plant.

Plans were prepared for a plant authorized by the War Department to treat ties and fence posts, which provide for a combination open-tank at Picatinny Arsenal.

Agreements were signed for work in cooperation with the Gulf Arm and Creosoting Company, of Hattiesburg, Miss., and the Alabama Wood Preserving Company, of Birmingham, Ala.

In investigating the scientific problems involved in wood preservation, reliable and simple methods of analyzing creosote and zinc chlorid and determining their presence in treated timbers, and of determining the effect of preservatives on the strength and other properties of wood, were found. Many urgent fundamental problems remain to be solved.

In the study of wood fungi the Service had efficient cooperation from the Bureau of Plant Industry through its Laboratory of Forest Pathology.

Tests of the strength and other important properties of American woods in the form of construction timbers and in such manufactured forms as buggy shafts, wagon axles, and harvester poles also showed how the strength of wood is affected by such factors as locality, rate of growth, or part of the tree.

Testing laboratories were operated in cooperation with Yale and Purdue universities and with the universities of Colorado, California, and Washington. The University of Idaho correlates its work and methods in testing with those of the Forest Service.

Tests were made of treated longleaf pine and Douglas fir bridge timbers to determine the effect of treatment on the strength of the wood in cooperation with the American Railway Engineering and

Maintenance of Way Association: of various species of hickory, to determine their relative values, in cooperation with the National Hickory Association; of redwood, to determine its value as a structural wood, in cooperation with the California Redwood Association; of dead timber from the National Forests of Colorado, to determine its value for mine purposes, in cooperation with several mining companies in Colorado; and of the effect on strength of various methods of drying.

Tests on joists cut from green and fire-killed Douglas fir at the laboratory at the University of Washington formed part of the Forest Service exhibit at the Alaska-Yukon-Pacific Exposition.

UTILIZING WOOD WASTE.

In attacking the vital problem of wood waste the Forest Service had the aid and hearty support of wood-using industries of every kind. No one solution of this many-sided problem will meet the need. The conditions presented by each industry must be the starting point for a patient study of possible economies. In certain cases a change in the character of the product will serve the desired end. For example, sawed railroad ties in place of hewed would save the waste of 280,000,000 cubic feet of wood annually. In others the problem is to utilize apparently unavoidable waste through by-products. Or the problem may be to find out for what new uses a particular kind of wood is fitted.

The yearly waste of wood through the death and decay in the forest of uncut trees is enormous. Many millions of feet of scrub pine in the East, tupelo gum in the South, and Engelmann spruce and several firs in the West go to waste because, with our present knowledge, they are of little use. Such woods, forming a large part of our timber supply, are studied and tested by the Forest Service. Engelmann spruce, lodgepole pine, Douglas fir, grand fir, scrub pine, tupelo, white fir, black gum, incense cedar, red maple, beech, and sycamore were tried for pulp. Engelmann spruce, white fir, and lodgepole pine have fiber that compares favorably with eastern spruce. In part as a result of Service tests new woods are coming into use in the western pulp mills.

Another means of lessening the drain of the paper-making industry upon existing forest supplies was sought through tests of cornstalk, rice straw, flax straw, bagasse, and cotton stalk fibers, made in cooperation with the Bureau of Plant Industry. It was found that a good, easy-bleaching pulp can be produced from rice straw and cornstalks, but much additional work is necessary to prove that paper can be made commercially from these materials. Cotton stalks do not produce an easy-bleaching pulp, and would find use only in cheap, dark papers, while the short fiber obtained gives little strength unless mixed with some longer-fibered material. Flax straw was found to cook with great difficulty, to require a very high percentage of bleach, and to screen badly, but could possibly be used for cheap wrappers.

Again, great waste takes place in wood discarded in the process of manufacture. Besides about two thirds of the wood cut for lumber, a large part of what is cut for railroad ties, poles, piles, mine timbers, cooperage, and other uses is lost in this way. Yet the ma-

terial lost is full of valuable substances. It is estimated that the saw-mill waste of yellow pine in 1907 would have yielded 36,500,000 gallons of turpentine, or 6,000,000 gallons more than the total production of gum turpentine in 1905. At 30 cents per gallon this would mean a value of nearly \$11,000,000. The waste of beech, birch, and maple is sufficient to produce 90 per cent of the wood alcohol and acetate of lime manufactured in the country, and if so used would yield a product worth annually nearly \$7,000,000. Some progress is being made in learning how to stop such wastes. During 1908 there were made, from waste yellow pine principally, 1,995,728 bushels of charcoal, 505,800 gallons of turpentine, 304,979 gallons of pine oil, and 966,675 gallons of tar, and at least one plant is making a satisfactory grade of wrapping paper from yellow-pine waste.

Close attention was given by the Forest Service to the problem of utilizing this valuable material now wasted. One of the greatest difficulties in the way of using yellow-pine waste is to obtain a pure, merchantable turpentine. During the year a very complete and carefully constructed turpentine-refining still was built for the Service. It is being used in standardizing grades of wood turpentine, and will undoubtedly give information of great value in distillation methods. Two national paint and varnish associations appointed committees to cooperate with the Service in testing the products practically, while turpentine manufacturers in the South supplied materials.

A special appropriation of \$10,000 was used to obtain statistics of the naval-stores industry and to examine into its future supply. The results strengthened the belief that in the future we must look more and more to mill waste for the turpentine supply.

The loss of sulphite liquor from pulp mills, pyroligneous acid from the distillation of resinous woods, and turpentine from dry kilns are other examples of the problems in preventing the waste of products which await consideration.

DIFFUSION OF INFORMATION.

In all its investigations the Forest Service has steadfastly aimed at usefulness. Studies are made not to advance science in the abstract, but to open the way to better practice. But right practice in putting all our forest resources to the best use depends on a thorough public comprehension both of the value of forests and of the methods which will get the most out of them. The work of diffusing information is no less important than that of gathering it.

During the year the Forest Service continued the diligent effort of the past to spread widely an understanding of what forestry means when put into actual practice and of the best ways to use forest resources. This was done through (1) advice to individuals, given on the ground or by correspondence; (2) the preparation and distribution of publications; (3) public addresses; (4) the loan and sale of lantern slides, pictures, and other material for the use of lecturers, writers, and others; (5) cooperation with teachers, public-school officials, and others connected with educational work; (6) exhibits at expositions; and (7) preparation of official information concerning forestry and the work of the Forest Service in brief typewritten or mimeographed statements, in conformity with the provision of the Agricultural Appropriation Act of 1909 and the

decision of the Attorney-General quoted in the report of last year. These statements were given wide circulation by the newspaper press of the country.

The cost of the diffusion of information reported on page 3 includes, as nearly as possible, all expenditures for the above lines of work, with the exception of the first, the cost of which can not be segregated from that of the several offices which answered the great number of requests for information on technical subjects. The amount reported, \$82,790.02, was about 2 per cent of the total expenditures of the Forest Service from appropriations. Exclusive of the cost of purchasing stencils for addressing machines, bought near the close of the year to cut off in future the cost of addressing envelopes by hand, the amount spent shows an increase over the previous year of 16 per cent. The greater part of this increase, however, is due to a change in the method of prorating against different lines of work the expenses of general maintenance and administration of the Service. In other words, the actual cost of the work of diffusing information was nearly the same as for the previous year.

During the year 63 new publications and 102 reprints were issued. The total distribution of new publications was 1,237,100, and of reprints 259,650.

The Forest Service mailing list was carefully revised and the number of names brought up to 750,000. The addressing machine bought and installed near the close of the year reduced the clerical force of the Service by 30 persons.

Members of the Forest Service, exclusive of forest officers, delivered during the year 359 public addresses. These were given, in response to requests, before gatherings of National Forest users, trade associations of wood users and similar bodies, chambers of commerce and boards of trade, meetings of farmers, educational assemblies, and the like. Except as these addresses were made in the course of travel necessitated by other official duties, the expense incurred was usually reimbursed. Only a minor part of the requests for addresses could be granted.

There were loaned or sold to persons outside of the Forest Service 4,995 lantern slides. Loaned sets of slides are usually accompanied by outlines to insure effective educational results. The collection of slides was overhauled and added to.

In its cooperation with teachers and others connected with educational work the Forest Service markedly enlarged its activity. A widespread desire now exists among teachers and officers of public instruction to utilize in school courses, usually in connection with nature study, geography, or agricultural education, some of the material of forestry and information concerning our forest resources. This opens an exceedingly valuable avenue for diffusing useful knowledge about the best use of forests, but careful preparation of the material is necessary in order to give it a form suited to educational use. In the single State of Iowa, as a result of the work of the Forest Service, forestry was introduced into 114 public schools. Four public schools in the city of Washington cooperated with the Service to devise a good method of utilizing forestry in the graded school course. Similar work for high schools was carried on in Philadelphia. Courses of study were prepared for other schools. Many teachers and pupils elsewhere volunteered as observers for the collection of pheno-

logical data. A circular letter to all school superintendents secured the names of schools in which forestry is now taught. Many photographs and some maps were supplied for school use, and three commercial firms were supplied with prints from which to make lantern slides for the same purpose.

An exhibit of the Forest Service at the Alaska-Yukon-Pacific Exposition showed by transparencies, bromides, maps, diagrams, and other material the activities of the Forest Service, the effects of right and wrong use of American forests, and forest products problems. Exhibit material was loaned to the New York Forest, Fish and Game Association, and also, on the request of the governor of Idaho, to the Idaho commission for use in the Idaho building at the Alaska-Yukon-Pacific Exposition.

WORK FOR THE ENSUING YEAR.

The work planned for the ensuing year will be outlined under the five main administrative divisions of the Forest Service, the Office of the Forester, and the branches of Operation, Silviculture, Grazing, and Products.

OFFICE OF THE FORESTER.

The Office of the Forester includes, besides the Forester and Associate Forester and their inspectors, the Law Officer, Editor, Dendrologist, and Statistician. These officers, with the Assistant Foresters (chiefs and assistant chiefs of branches), form the Service Committee, which, under the Forester and Associate Forester, has jurisdiction over questions of general administrative policy.

The legal work of the Forest Service includes advice given the Forester, the branches, and the District Foresters on contracts and all questions of law which arise in the conduct of Service business; cooperation with the Department of the Interior in public-land law questions on National Forests; advice upon request from state authorities and individuals concerning state forest legislation; and investigations in the field of forest law. The work of the ensuing year will continue the work of the past along these lines.

The Editor will, during the ensuing year, have direct administrative charge of all the work of the Service in the diffusion of information to the public, except that done through correspondence and advice on the ground by technical offices. Administrative charge of all printing and publishing activities, public addresses, the loan and sale of lantern slides and other illustrative material, cooperation with educators, and public exhibits will be transferred from other offices to that of the Editor. Greater activity in the publication of technical forest literature is planned, but without abatement of past efforts to popularize and spread widely practical knowledge at every possible opportunity. Publications summarizing the results of past work in various fields, and others utilizing new information gathered in the calendar year 1908, will serve the latter purpose. Requests for public addresses before other bodies than National Forest users will, as a rule, be refused unless all expenses are reimbursed. An exception will be made, however, in the case of teachers' associations, state educational conventions, and similar opportunities to advance the work in cooperation with schools. This work will be expanded.

The Dendrologist will continue investigations of the geographic distribution of American trees and of related forest problems.

The statistical work of the Service will include the gathering of data concerning forest fires and investigations in connection with imports and exports of forest products, as well as the continuation of past studies of production, consumption, and existing supplies in the United States.

BRANCH OF OPERATION.

Improvement work will be concentrated on building and improving roads, trails, telephone lines, and other means of communication on the Forests. These are absolutely necessary for the protection of the Forests against fire. The experience gained in the past three years will make possible a high standard of economy and efficiency. Cooperation will be carried on with counties, communities, and individuals in road, trail, and bridge construction, and with stockmen in building and improving drift fences and watering holes.

The detailed examination of National Forest boundaries begun in May will be finished by the close of the present field season. The data obtained will be used to make any needed corrections in the present boundaries, in so far as this can be done under existing laws.

During the coming year a detailed classification of the lands within the National Forests will be begun, in cooperation with other Government bureaus.

Special attention will be given to the improvement of the Forest personnel. Examinations for forest rangers will include a basis for a rating on education as well as experience, since many rangers have been found to lack sufficient education to handle the business which is now intrusted to them, or to be qualified for promotion to be forest supervisors. Forest officers will continue to be detailed for temporary service in the district offices, while meetings of supervisors and rangers and special ranger courses will provide for instruction in the better handling of Forest business.

Cooperation with States, communities, and individuals against fire will be carried on more extensively than in the past. Negotiations now pending with railway lines for cooperative fire agreements will be concluded early in the year. Uniformity in the statistical records of all the districts will be secured by having all periodic reports compiled in identical form on standard sheets for the district atlases and the figures summarized for the Service Statistical Atlas from duplicates forwarded to Washington.

Important changes to eliminate duplication in accounting records will be made. The Washington office will keep only general records of receipts and expenditures in the six National Forest districts. The district offices will in turn leave to the offices of supervisors the detailed accounts of expenditures on projects and lines of work upon the Forests. This change will result in uniform accounting records throughout the Service and reduced routine work.

BRANCH OF SILVICULTURE.

Sales of National Forest timber will be made wherever it is possible to remove mature timber and make room for a new crop without jeopardizing future supplies or disposing of timber at an undue sac-

rice. To gather information as to where sales should first be made, to what extent and in what way timber should be sold, and how it may best be removed, reconnaissance studies will be pushed extensively. The information secured will help the would-be purchaser as well as the Forest Service in selling timber. It is evident that with recovery from the business depression the volume of sales will materially increase.

Extensive studies on cut-over areas will seek an authoritative basis for calculating growth after lumbering. Thus far most growth tables have been based on conditions in virgin forests, which give inaccurate data for computing growth after the forest is opened up. Yield tables will be prepared for a number of western species. Results obtained from different methods of cutting will be studied, as well as the influence of forests upon stream flow, the breeding of trees, and differences in growth of trees due to the source of the seed.

Experimental planting and sowing and the introduction of new species will be pushed forward.

At least one more experiment station will be established, probably in District 2.

Cooperation with other departments will continue on request for technical advice or supervision of timber work.

In state cooperation the study of forest conditions in Kentucky will be continued and probably completed. A detailed study of the forest resources of Illinois will be started. Cooperation with the North Carolina Geological and Economic Survey will begin in a study of the forest conditions of the western part of the State. An investigation of the woodlot conditions of Virginia will aim at helping the farmers of the Piedmont region to protect and make better use of their old field timber. Preliminary examinations of forest conditions, similar to those in Alabama and Florida, will be made in South Carolina and Mississippi, and probably in Georgia, Tennessee, and Ohio also. Cooperative experiments in nursery and planting work will be continued with state institutions and with Hawaii. The study of forest taxation in several States, including Wisconsin and Kentucky, will probably be made along the lines of the New Hampshire study.

The number of applications for the examination of private forest land continues to increase. Cooperation with large mining, lumber, and other wood-using companies which own forest land opens a field for advancing forestry which should not be neglected. Several important working plans will probably be made during the ensuing year. Other studies of forest planting and forest trees will be conducted as opportunity arises.

BRANCH OF GRAZING.

During the year data concerning the prices charged for grazing privileges upon military and Indian reservations, Reclamation Service withdrawals, and state, railroad, and other privately owned tracts of land, in comparison with the fees charged upon National Forests, will be collected. The information will furnish a basis for equitable adjustments of the grazing fees upon different Forests and for different kinds of stock.

The killing of predatory animals will be continued upon an enlarged scale. It is planned to employ hunters upon approximately 100 Forests for an average period of three months. This will double the work of 1909 along this line and will substantially satisfy the demands of stockmen.

In range development, besides the studies now under way of summer ranges, studies of year-long ranges will be made. The object will be to determine whether the valuable forage grasses and plants with which the now depleted ranges were originally stocked can be restored, either by natural reseeding, improved methods of handling the stock, or by artificial reseeding with native and introduced grasses. Observations at the coyote-proof pasture and the other inclosures will be discontinued after the close of the calendar year, and new investigations will be started in other parts of the West. Arizona, New Mexico, and Colorado offer especially desirable fields for work of this character.

BRANCH OF PRODUCTS.

The laboratory investigations which form the most important part of the work of the Branch of Products will henceforth center in Madison, Wis. For several years the need of a general forest products laboratory has been increasingly felt. It was plain that decided advantage would be gained by having such a laboratory connected with a prominent university. The question was accordingly taken up with the several universities most advantageously situated. Attractive proposals were made by nearly all of them. The proposal of the University of Wisconsin was accepted as providing, all things considered, the most advantageous conditions. Under the agreement the university is to provide a laboratory building constructed in accordance with plans furnished by the Service, and power, heat, and light. The Forest Service is to furnish all machinery and the testing force, which will consist of about 30 persons. The laboratory will rank among the best equipped wood-testing laboratories of the world, will give the Service great advantage in dealing with all problems connected with the utilization of forest products, and will form an important experimental center for all wood-using industries. The building should be ready for occupancy by January 1, 1910.

When the laboratory is equipped and ready for work, the wood-pulp laboratory at Washington and the timber-testing laboratories at Yale and Purdue universities will be closed. The centering of all experimental work in one laboratory will make both for economy and efficiency. Among the fundamental problems to be taken up will be—

In wood preservation: The determination of the fractions in coal-tar creosote which are most effective in preventing attacks of fungi and marine borers; the testing of water-gas tar, crude oil, and wood creosote for their preservative value; the testing of aluminum compounds and other cheap salts to determine whether they are effective preservatives; and the finding of a cheap, effective medium for heating timber preceding treatment.

In wood distillation: The continuation of tests to purify and standardize wood spirits of turpentine; the study of the properties and possible uses of other products of softwood distillation, such as wood

creosote, pine oil, and pyroligneous acid; and the finding of methods of recovering rosin in the steam distillation of softwoods.

In tests of woods for pulp: The finding of methods of utilizing mill waste in pulp manufacture and the testing of unused woods for their pulp value.

In wood technology: The study of the relation of the structure of woods to their physical properties and to their behavior during commercial processes, such as preservative treatment; the effect on structure of commercial processes, such as kiln-drying and preservative treatment; the effect on physical properties of various methods of drying; and the relation of structure to heat conductivity.

In timber testing: The effect on the strength of timber of commercial processes, such as kiln-drying and preservative treatment; the relation between physical properties and the silvical conditions under which the tree grows; and the continuation of tests to determine the fitness of various woods for specified uses.

The laboratory will also direct field experiments and demonstrations to apply under commercial conditions the results obtained. Such work in all cases will be cooperative. In a larger degree than in the past cooperation will be with associations rather than with individuals, since this will lead to more rapid and general acceptance and application of results.

No other laboratories will be maintained by the Service except the timber-testing stations in cooperation with the Universities of Colorado, California, and Washington. These will work on problems directly concerned with the utilization of products of the National Forests, and their work and methods will be closely correlated with the central laboratory.

The studies of wood utilization will be conducted from Chicago. The work of obtaining records of wholesale lumber prices will be continued, and the gathering of prices at the mills, for which plans have been completed, will be initiated. Studies of lumber markets and of the requirements and practices of wood-using industries will be continued. The compiling for publication of the data which the Service has collected on the uses of American woods, together with the conditions which lie back of these uses, will be prosecuted steadily. When completed, the work will make available for the first time a comprehensive statement on the uses of American woods.

